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The JOURNAL OF THE DEPARTMENT OF AGRICULTURE
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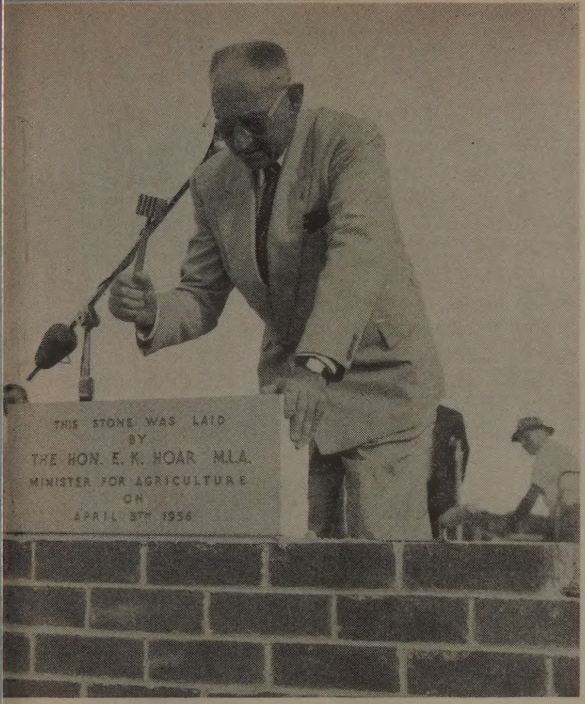

NEW DEPARTMENTAL BUILDINGS

•

FOUNDATION STONE LAID

•

ON April 5, 1956, the Minister for Agriculture (the Hon. E. K. Hoar, M.L.A.), laid the foundation stone of the new Department of Agriculture buildings at the corner of George Street and Jarrah Road, South Perth. The ceremony was attended by the Premier (the Hon. A. R. G. Hawke, M.L.A.) and members of the State Parliament, a number of prominent citizens and senior officers of the Department of Agriculture.

In an introductory address, the Director of Agriculture (Mr. G. K. Baron Hay), said that this was indeed a "red letter day" for his Department which, for many years had operated under tremendous difficulties in five different and widely separated buildings in the metropolitan area. The growth of the Department in recent years had further intensified the housing problems and it was encouraging to him and to his officers to see these tangible preparations for adequate and permanent accommodation.

The site was 25 acres in extent and should suffice for the needs of even an expanding Department for many years to come. It was ideally situated in an elevated position commanding excellent views of Perth, the Swan River and the Darling Range, and was convenient for farmers coming into the metropolitan area.

The present plan called for the construction of two blocks of two-storey brick buildings designed to house technical and administrative personnel. In addition, there would be glasshouses to facilitate plant research work, storage buildings and a depot for Argentine ant control equipment and personnel, with adequate garage and parking facilities.

Block A, would be 250ft. long and 40ft. wide said Mr. Baron Hay, and would house the administration and extension services, including the film unit, a photography section and library. The vermin research and botanical laboratories would also be situated in this building.

Block B, which would be the first of the major buildings to be erected would be even larger than Block A and would accommodate those technical staffs now working under unsatisfactory conditions in converted offices and other makeshift quarters.

Plant pathology, dairy laboratory, weed control and seed certification, plant research, soil conservation and saline soil

research, agrostology and cereal research would be among the activities conducted in this block.

It was hoped that the main blocks would be completed within two years, and two further blocks were "on paper" to meet future needs.

The Premier (the Hon. A. R. G. Hawke) said that he had not been Premier very long before the Minister for Agriculture (Mr. Hoar), and the Director (Mr. Baron Hay), had emphasised the seriousness of the department's accommodation problems, and had taken him on a tour of inspection of the present quarters.

He was appalled by the unsatisfactory conditions under which many of the officers were working in the old buildings. The splendid results achieved, despite the difficult conditions, redounded to the Department's credit, and he was pleased to have been able to inaugurate a building project which was so obviously necessary.

Mr. G. P. Wild, M.L.A., representing the Leader of the Opposition (Sir Ross McLarty), and Sir Charles Latham, M.L.C., representing the Leader of the Country Party (the Hon. A. F. Watts, C.M.G.), paid tribute to the work of the officers of the Department of Agriculture and emphasised the important role which primary production had played in the successful development of the State.

LONG OVERDUE

The Minister for Agriculture (the Hon. E. K. Hoar), said that if Western Australia hoped to keep abreast, or in advance, of other countries in developing her agricultural potential, these buildings were long overdue.

Our departmental officers had been responsible for some far-reaching discoveries in connection with animal and plant diseases and nutrition. In the development of our light lands they had rendered a magnificent service to the farming industry and the State as a whole.

The real value of the new buildings could not be measured by the amount of money spent on their erection as he felt sure that they would pay for themselves many times over.

Mr. Hoar paid a tribute to the Premier who had found about £300,000 for the building project, and had always been sympathetic towards the needs of the Department of Agriculture.

In declaring the foundation stone well and truly laid, the Minister said he hoped and trusted that the completed buildings would be a source of inspiration to all those who worked in them in the name of Agriculture.

At the conclusion of the ceremony, the Director presented the Minister with a memento of the occasion—an inscribed mallet made from local timbers.

KEEP YOUR JOURNALS

HERE at the production end, we are sparing neither expense nor effort in making the "Journal of Agriculture" a publication which will help you in your farming operations.

We suggest that the Journal is worth keeping and that a year's issue will make an attractive and useful volume for your library—a volume that is full of sound factual information, attractively presented.

Arrangements have been made for the compilation of a comprehensive index to be incorporated in the December issue—a feature which will greatly enhance the value of the Journal as a work of reference.

Fig. 1.—A wool show-floor during valuing week.

IMPROVE YOUR WOOLCLASSING AND YOU'LL IMPROVE YOUR RETURNS

By J. REILLY, Sheep and Wool Instructor

THERE is an old story, still going the rounds, about a farmer who pitchforked his wool straight into the press, and obtained the top price for the district. It might even be a true story, for most of us can remember the "good old days," when overwhelming demands prompted buyers to purchase almost any types of wool at no-limit prices.

Those days are gone however, and the woolgrower of today cannot hope to obtain the highest financial returns unless he is able and willing to prepare his clip with due regard to the buyer's requirements.

During the recent boom years, there were times when some buyers did not discriminate greatly between good and mediocre classing. That is not the case today and during the current season's sales we have often seen bales almost emptied on the show floor during a buyer's rigorous inspection.

INSPECTION OF CLIPS ON SHOW FLOORS

Some woolgrowers are not aware that officers of the Sheep and Wool Section of the Department of Agriculture

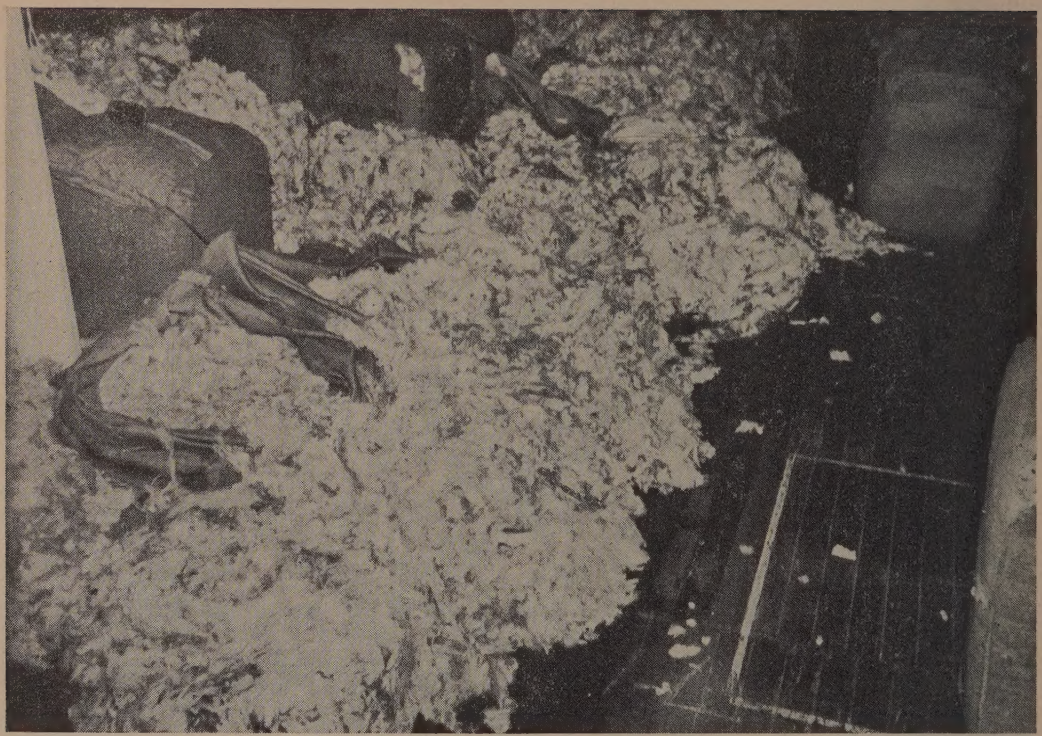

Fig. 2.—Bales almost empty after a rigorous inspection of a line on the show-floor.

will, if requested, inspect clips on the show floor. They will advise growers on the degree of classing skill shown in the preparation of the clip and note faults in the wool that may call for stricter culling, better selection of rams, or factors such as copper deficiency which result in lack of crimp and general plain-ness of the wool.

All that is necessary to obtain this free service, is a request accompanied by the grower's name and wool brand, the broker's name and the sale date.

IMPROVE YOUR CLASSING

Woolgrowing and woolclassing have a natural affinity. To be able to handle and class wool is a MUST in growing good wool; for it is the basis of such wool improvement measures as culling and ram selection.

The more a grower learns about his wool through classing the better he equipped to apply such measures as may be necessary to improve his clip—and his financial returns.

To see his clip displayed when it is opened on the show floor prior to sale is an excellent opportunity for a grower to judge his handiwork. Not all growers can take advantage of this opportunity however and this is where the Sheep and Wool Section can assist him by offering expert advice.

SOME COMMON FAULTS

In recent years, officers of the Sheep and Wool Section have inspected many clips at the owners' requests, and looking back over the reports on these inspections we find that most of the faults can be grouped into three main categories which —for want of better terms—we have called:—

(1) Odd misfits.

(2) General improvement needed.

(3) Rough and careless work.

Fig. 3.—A buyer valuing a line on the show-floor.

Odd Misfits.

Under this heading are the clips of many growers who have been genuinely anxious to make a good job of their wool-classing but whose earnest desire to make as many bales as possible of their "top line" has led them to include occasional over-strong or heavy-conditioned fleeces.

While a big line is highly desirable from every point of view one must guard against including these "misfits."

Repeatedly we have seen good Merino 60's-64's lines spoilt by the inclusion of 58's or even lower counts.

To the discriminating buyer, these over-strong-for-the line fleeces create doubts. He wonders how many are scattered through that particular line and he could "play safe" by a lower valuation.

A similar position arises when greasy heavy-tipped fleeces occur in a fairly light-conditioned line. In this case, the buyer could "play safe" in his estimation of yield.

These "odd misfits" pull down the price of otherwise well-prepared clips—clips in which the growers have been careful to match for even length and good colour and have kept the line free from "doggy" fleeces. In general they have done a good job, but those odd good-style but over-strong fleeces have been allowed to go into the AAA instead of the BBB lines.

A report on his clip, pointing out this tendency will often prevent a grower from repeating his mistake in the following year.

General Improvement Needed.

In this category, we would include a number of growers who are not using a BBB line for their stronger wools and consequently their lines—although matched for length and colour—are very mixed in quality. We use the term "quality" in its wool-classing sense in referring to fibre diameter.

Fig. 4.—There is far too much good wool in this bale of locks.

Another common fault is the inclusion of tender fleeces in a generally sound line, usually through insufficient care in testing for soundness.

Then there is the grower who fails to employ a bulkclass line to the fullest advantage, with the result that some of his lines contain doggy and even matted fleeces. It is not hard to find bales containing a few cotts (matted wools) while actually the bulk of it is free, and the same applies with doggy fleeces.

Poor skirting of the fleeces is another deterrent to the buyer. Rough breech wools, oaty necks, burry flanks, etc., cause a number of buyers to think twice before valuing the lot. There are numerous points that, when attended to correctly, can bring about an improvement in the get-up of a clip and a higher cash return to the grower.

An inspection would reveal to what degree the basic principles of woolclassing have been observed and advice given enabling the classer to raise his standard. Eventually good work can be done, and with it comes the assurance that your clip will meet fully competitive buying and not from a section of the buying trade only.

A number of growers to whom woolclassing inspection reports have been forwarded have followed up this move by having their further endeavours checked. It is some satisfaction to know that a number of them are now turning out first rate jobs.

Rough and Careless Work.

In the previous categories we have included the growers who, while genuinely anxious to improve the get-up of their clips, do not have the experience and "know-how" to achieve good results.

Many of them are ready to accept constructive criticism, and their clips subsequently show a marked improvement in preparation which is reflected in higher financial returns.

There are still far too many growers whose clips are carelessly handled, being badly-matched and badly skirted.

Clips of this nature can always be sold. There are plenty of people anxious to buy them—at a price—so that they can rehandle them and make them acceptable to the trade—at a profit.

A little care in the original preparation of the clip would divert this extra profit to the grower's pocket.

Even in reasonably well-prepared clips, there are a number of bales which could often be handled more advantageously. We refer to the skirtings and oddments, particularly the pieces and locks.

Many lines of pieces contain short topknots, stains, leg trimmings, etc., which lower the value of the line. These should be kept out of the piece lines.

Fig. 5.—A section of the Bulk-Classing Department. It pays to make full use of this service.

Locks too, should not contain stains which should be baled or bagged separately, after drying, and sent for bulk classing.

Closer attention to the preparation of these lesser lines can be of considerable help in lifting the average price per pound of the total clip.

RECORD CLOVER SEED HARVEST

The present season's production of certified subterranean clover seed has totalled 1,781 tons exceeding the previous record total of 1,616 tons harvested in 1954. This season's record harvest consists of:—

Dwalganup	1,336½ tons
Mt. Barker	150 tons
Yarloop	274 tons
Bacchus Marsh	15½ tons
Tallarook	5 tons

It is proposed also to clean and grade a further 130 tons of Dwalganup clover in the Narrogin district during the winter season.

Unfortunately owing to the large local harvest and heavy records in other States the prices for most lines are considerably lower than in previous seasons.

Although there is a demand for the Mt. Barker, Bacchus Marsh and Tallarook strains, Dwalganup, and to a lesser extent, Yarloop, have been produced in excess of immediate requirements.

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Fig. 1.—A bee-keeper's lorry in 1911. Wilfred Dunderdale and James Myers, shown in the photograph, were working for Messrs C. and A. Smith at Copley's Estate, Bakers Hill. The lorry, which is loaded with extracting equipment, was used to transport hives to areas with good nectar flows. As it was not safe to take the horses close to the apiary, the hives had to be closed and man-handled for 100 yards or more before loading.

BEEKEEPING IN WESTERN AUSTRALIA

Some Historical Notes

By R. S. COLEMAN, Officer-in-Charge, Apiculture

ALTHOUGH the southern portion of Western Australia is richly endowed with nectar-bearing flora suitable for the production of large quantities of excellent honey, there were no colonies of honey-bees in the area prior to the establishment of the Swan River Colony in 1829.

Native bees existed, but they were mainly solitary in their habits and, although occasionally two or three bees worked and nested together, they lacked the colony instinct of their relatives in other lands.

The pioneer settlers of the Colony, faced with the difficulty of importing all their sweetening materials, rightly surmised that the Australian bush could support a large bee population and made strenuous attempts to introduce European bees into the new land.

The difficulties of transporting hives in sailing-ships over thousands of miles of sea were eventually surmounted—but it was only after a long record of failures and bitter disappointments that European bees were successfully established in Australia.

Once the initial problems of introduction had been overcome, the bees found conditions ideal for successful honey-gathering. Bees from the settlers' hives swarmed and multiplied. Many swarms "went bush" and, before many years had elapsed, the "bee-tree" had become a common feature of the forest country.

Since its initial establishment over a century ago, the beekeeping industry has seen many changes.

The scientifically-designed Langstroth hives have superseded the straw "skeps" and gin-cases which housed the early bee

colonies. The English black bees have given way to the more docile Continental strains, and from the stationary hives of our forbears we have progressed to migratory beekeeping—first by horsedrawn vehicles and now by huge motor-trucks travelling through the night loaded with hives being transported to nectar-bearing areas.

PIONEERING PROBLEMS

It is recorded that bees were first introduced into New South Wales, by a Captain Wallace (or Willis) of the "Isabella" in April 1822, and into Tasmania by Dr. Wilson of the Royal Navy on the ship "Catherine Stewart Forbes" in 1831.

There is some doubt concerning the date of the first successful introduction into Western Australia. The first reference to bees appears in the diary of Captain J. Molloy who landed at the Swan River from the "Warrior" in 1830.

On December 1, 1829, he wrote:

> Had the bees upon the deck. Inspected them and cleared out the hive and found a great number dead.

Mary Bussell who came to the Swan River Colony on the "James Pattison" in 1834, also attempted to bring a hive of bees from England but the following extracts from her letters and diary indicate some of the difficulties and disappointments she experienced.

Monday March 3, 1834.

> I am very anxious about my bees. So many have died within the last day or two. According to Mr. Sherratt's advice, I have changed their food, perhaps tomorrow may render me more easy about them.

Tuesday, March 4, 1834.

> I have cleared away all my poor dead bees. From the number, I believe very few more could be in the hive and I reproach myself for bringing them away, but to die at sea . . . . I have been obliged to remove the bees that are dead from the hive once or twice, since on one occasion a great many of the poor little things revived and at night returned to our scuttle—bees in every direction. Mama, Mr. Sherratt's children, and myself were dreadfully stung, nor did we succeed in saving any of them. The few we caught died before daylight when I got up to return them to the hive.

March 5, 1834, Cape Colony, Table Bay.

> My bees have not swarmed and hundreds of them are dead, but yet I hope I may save sufficient to form a stock.

Apparently none of the bees survived the voyage for, in one of her letters to her mother, written after her arrival in the Swan River Colony, Mary Bussell refers to "Foot's dog and cat" as "the only live things" to be landed.

Writing in 1835, Captain Irwin states:

> Bees have been landed at King George's Sound since our last report.

In his diary, first published in 1842, Mr. Geo. E. Moore, a former Advocate-General (who left the State on completing his first term of office in 1841) writes:

> A species of the leafcutter bee is indigenous; but the honey storing bee has not been found, and I think, does not exist. Several attempts have been made to introduce the bee from England, but whether from the length of the voyage, or from want of proper management on arrival, they have been hitherto unsuccessful. This is to be regretted, as from the numerous honey-bearing flowers in the colony, there is not doubt of their succeeding well. Governor Hutt has offered a premium to the first successful introducer of them.

THE NAVY HELPS

The next record of bees in the Swan River Colony is found in a copy of the "Inquirer" dated November 11, 1846. In the long and involved sentences so dear to journalists of a bygone era we are told how the Royal Navy apparently succeeded where private individuals had failed. The paragraph reads as follows:

BEES

> We are enabled to congratulate our settlers on the first swarm having taken place in the colony. The hive which the persevering patriotism, for after all there is no patriotism more true than that which seeks to introduce into new countries the foundations of future blessings; the persevering patriotism of Lt. Helpman, R.N., after more than one unsuccessful and discouraging attempt, succeeded in establishing at Fremantle, a hive which swarmed on Friday last, and, a new hive being in readiness, the young swarm was carefully secured and will we trust, found their own colonies through Western Australia "in saecula saeculorum." And here we really feel that we have a right to express the thanks of the colony to Lt. Helpman for his unceasing efforts on every voyage to bring some valuable addition to our colonial resources, and this in a class of subjects, as fruit trees, the silkworm, bees, etc., etc., requiring an anxious and skilful care, which can result only from the most warm and ruling desire to confer kindness and do service to the colony to which he is attached.

Fig. 2.—Mr. A. Cook's home apiary at Coondle in 1907. With his brother, S. Cook, he managed over 400 hives at Coondle and Hoddys Well.

Now, tracing back through the voyages of Lt. Helpman, it is apparent that he must have brought these bees into Western Australia either on June 12, 1846 when he returned from a voyage to Adelaide, or alternatively when he returned on March 2, 1846 from Sydney via Launceston. Unfortunately, there is no note of his cargo in the papers of that period, nor is his log of the period available.

It appears probable that the bees were introduced following upon his trip to Sydney, in which case the first really successful introduction of bees to Western Australia was on March 2, 1846.

In his book "Western Pioneers," the late Mr. Jesse Hammond, writes of an incident at Guildford in 1873 in the following words:

> One afternoon, as I was returning from the Swan, I called at Mr. William Jones' home at Guildford. He was my uncle and had a very large bee farm, the only one in the colony at that time. He was a cooper by trade, and made little kegs to put his honey in, and casks for the colonists who made wine. He came to the colony in 1830 in the "Rockingham." That afternoon he gave me a swarm of bees, which he secured, as he thought—in a box with some honey.
>
> I went off with this in the cart, and when I came to a stretch of smooth road over the Helena River Bridge, I started the horse into a trot, and the jolting of the cart upset the bees. They came out and attacked me in thousands, and I had to jump out of the cart and run.
>
> Fortunately for me, there was a tree with a very bushy top, which had been cut down, and I crawled among the leaves for shelter. I could hear the horse galloping away with the cart, but did not dare move . . . . My face, hands, neck and arms were swollen to an enormous size . . . . but I had to keep on after the cart . . . . Three days later, I was quite well, and back at work again.

THE WAX MOTH APPEARS

The wax moth was reported in New South Wales in 1872 and this pest wiped out many colonies of the English black bees. Italian bees, which were better able to cope with the wax moth, were brought to Australia two years later.

During the "eighties," the wax moth killed out many colonies of the English

black bees in Western Australia and the Italian strains were introduced—presumably from the Eastern States.

Bees had apparently spread widely throughout the State, for a press report on January 12, 1881 mentions that three gallons of honey were taken from a "bee-tree" in the Victoria Plains district.

Later in the same year, (September 6, 1881) it was reported that 16 cases of Swan River honey were sold in London.

BEEKEEPING IN THE "NINETIES"

Commercial beekeeping commenced to make headway during the last decade of the century. Between 1894 and 1896, Mr. John Ayer of the Mel-Bonum Apiary, North Perth was writing articles on apiculture for the Bureau of Agriculture's Journal, and Mr. R. Helms, then the Bureau's biologist also wrote several articles including one on American Foul Brood.

In 1896, Messrs, C. and A. Smith, two brothers from the York Peninsula, South Australia, arrived in this State with their bees. Using horse-drawn vehicles to move their hives from site to site, they became the first migratory beekeepers in Western Australia. The Smiths later engaged in large-scale wheat farming and in 1922 they sold their hives to the McNamara brothers of York who continued as large-scale honey producers.

Helping the Smiths at their Baker's Hill apiary were two cousins, Arthur and Charles Cook, who had gained a knowledge of beekeeping by helping Arthur Cook's father on his apiary at Smithfield, New South Wales.

The Cooks later moved to the Toodyay area to become commercial apiarists on a large scale. They owned the largest number of hives of any apiarists in Western Australia.

BEEKEEPERS' ASSOCIATIONS

In 1900, the suggestion was put forward that a West Australian Beekeepers' Association should be formed, and the first meeting of the Association was held on June 13, of that year when 16 members attended.

Branch associations were formed at Wagin and Albany a few years later, the latter being known as the Plantagenet Beekeepers' Association.

Records show in 1903, there were beekeepers owning 3,100 colonies between them. Honey production in that year was given as 268,800 lb.

It is interesting to note that from that 3,150 hives in 1897, the honey production was 93,940 lb.

In 1955, from a total of 26,971 productive hives, the honey production was 6,366,000 lb. of honey or an average of over 236 lb. per hive.

POTASH FOR PASTURES

During 1953, farmers in Western Australia used only 30 tons of potash fertilisers on pastures. In 1955, the quantity used had jumped to 395 tons—more than 13 times the 1953 requirements.

The increased use of potash for pastures is a direct result of work carried out in recent years by officers of the Plant Research Division of the Department of Agriculture, and provides still another example of the value of scientific research to the practical farmer.

As a result of the experimental work carried out in this State it has been demonstrated that the judicious use of potassic fertilisers on the lighter-textured soils of our South-West resulted in greatly improved growth of subterranean clover pastures with healthier stock and increased productivity.

In the past, most of the potash used in the State has been applied to orchards, market gardens and potato crops.

Fig. 1.—The carry-all, with smoker fuel, smoker, veil, hat and gaiters

A BEEKEEPER'S CARRY-ALL

By S. R. CHAMBERS, Field Assistant (Apiculture)

TO have all one's working gear conveniently placed in a readily portable unit, saves time and trouble in the apiary, and this handy carry-all has already proved its value on hive inspection work.

It enables a burning smoker to be carried from place to place with a minimum of fire risk, and is designed so that hive-tools, extra smoker fuel, veil, hat, gaiters, notebook, pencils etc., are all ready to hand when and where needed.

The carry-all is made from two honey-tins or kerosene-tins. The centre portion which accommodates the smoker and hive-tools is one complete tin cut obliquely so that the lid is deeper in front than at the back. Measure up about 12in. from the bottom and cut horizontally across the back of the tin, then measure 8in. from the bottom and make a similar cut across the front. Join these two cuts by two sloping cuts along the sides of the tin.

To give added strength, solder a fencing-wire reinforcement along the edges of the cuts, rolling the tin over the wire if you have sufficient skill as a tinsmith.

A single 3in. butt hinge is fixed in position by gutter-bolts and solder at the back of the tin and it will be found that the lid, being deeper in front remains closed, sealing the smoker when in transit.

To prevent annoying rattles, and to give a still closer seal, slit a length of small-diameter rubber tubing lengthwise and slip it over the edges of the box. It may be attached by a few fine wire ties at intervals.

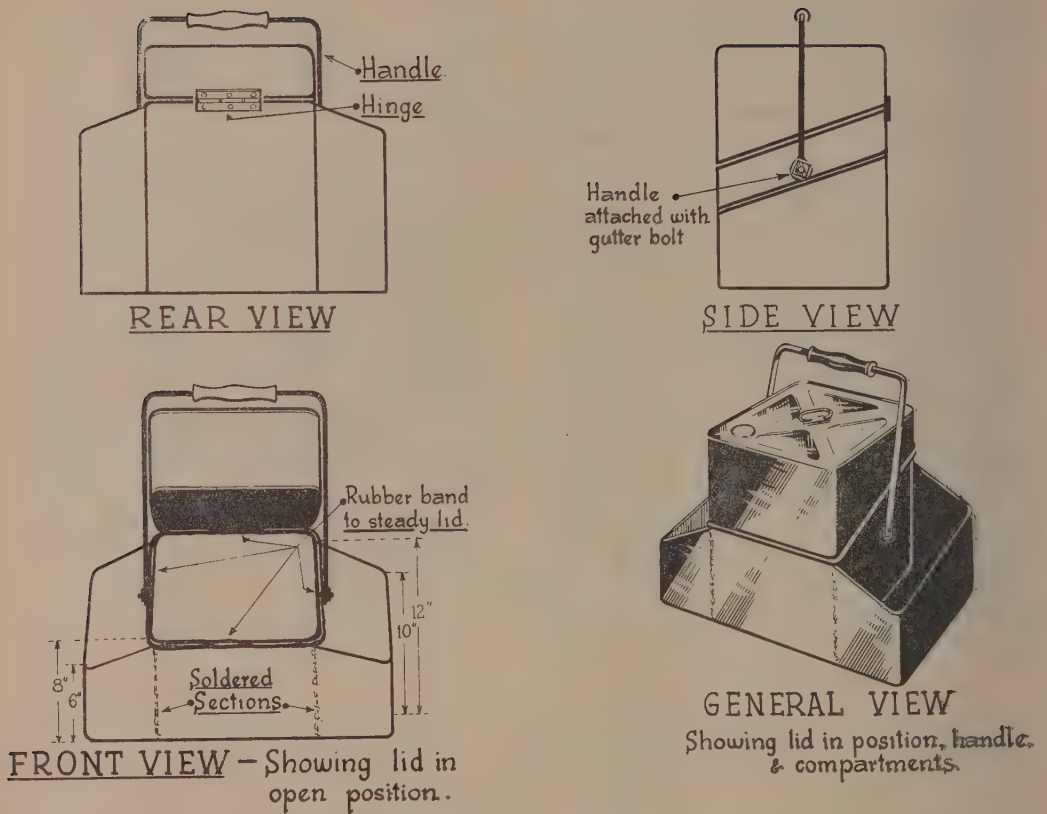

Fig. 2.—Diagrams showing constructional details

Two larger gutter-bolts or eye-bolts are inserted in the sides of the tin and soldered in position. These take the handle, made from heavy-gauge wire with a length of conduit pipe or rubber to give a comfortable grip.

The two storage compartments are made from the two halves of a honey-tin which has been cut vertically down the centre.

The two halves are cut so that they reach to the edges of the centre box at front and rear and are sloped away to the outer edges. They are given a slight overlap and soldered to the centre portion. Leave the bottom seams unsoldered to permit drainage if necessary.

Smoker fuel, such as pine needles, is carried in one side, while the other takes veils, linen hat, gaiters and notebook.

This simple item of equipment has been tested and proved satisfactory in the field, and any beekeeper will find it well worth constructing.

BRANDS ON POTATO BAGS

Since the recent promulgation of regulations under the Agricultural Products Act, it is an offence for potato growers to forward potatoes to market unless brands other than the grower's brand have been removed or obliterated.

Bags should be stencilled in a conspicuous place in letters not less than two inches in height with the name and address of the grower followed by the word "Potatoes" and the grade thereof. Any other name, brand or mark of any kind should be completely obliterated or removed from the containers.

Book Review.

NEW HANDBOOK ON POISON PLANTS

An Outstanding West Australian Publication

THE West Australian Government Botanist (Mr. C. A. Gardner) and the Principal of the Animal Health and Nutrition Laboratories (Dr. H. W. Bennetts), are the co-authors of a new publication "Toxic Plants of Western Australia," which undoubtedly sets a new high standard in pastoral and farming literature.

The book, which has been entirely produced in Western Australia by the Periodicals Division of West Australian Newspapers Ltd., is a handsome volume measuring 10in. x 8in. containing 252 pages of letterpress with 52 full-page colour plates by Edgar Dell and C. A. Gardner and 45 full-page line drawings by C. A. Gardner. It is particularly well-printed on paper of an exceptionally high quality and is attractively bound in red with white lettering.

The reputations of the authors in the fields of botany and veterinary pathology respectively are in themselves a guarantee of the authenticity and knowledgeable presentation of the subject matter.

In a forward to the book, the Director of Agriculture (Mr. G. K. Baron Hay) writes:—

> "The authors have achieved, in a single book of moderate size, the most difficult task of presenting botanical data in a manner to satisfy scientific readers, while permitting those knowing little of botany—but who are interested in the toxic properties of suspected plants—to establish their identity and to recognise the symptoms of poisoning in stock which may have eaten them.
>
> "This collection of valuable records may never have been assembled if the authors, as young men 30 years ago, had not only been brought together officially, but had found also social interests which led to a deep and lasting friendship. A better team would be difficult to imagine, an outstanding botanist prepared to literally tramp the wilds in search of specimens and a keenly trained veterinary pathologist to observe and record authoritatively the toxicological data."

The need for a book of this nature has long been evident, as stock losses from poison plants have been a feature of Western Australian livestock husbandry from the beginning of agricultural and pastoral settlement until the present day.

Individual articles have been written from time to time covering special aspects of the plant poisons, but stockowners have always felt the need of a publication which would present all the information available in concise form.

Such a publication is now available in "Toxic Plants of Western Australia"— a work which will be acceptable to scientist and layman alike. The written descriptions of the plants, together with the magnificent illustrations in colour and black and white, make the recognition and identification of the plants simple, even to one with no academic knowledge of botany.

The book covers a wide field, including not merely those plants known to contain definite toxic principles but species such as stinkwort which are responsible for mechanical damage to the intestinal lining, and others such as Guildford grass which may give rise to "hair-balls" that can cause obstruction of the bowels or stomach.

Many plants, normally regarded as valuable fodder species have been included in the book; thus we find subterranean clover and the West Australian blue lupin described, both of which can be potentially dangerous if taken as the main constituent of the diet over a long period; burr trefoil which can cause photosensitisation; *Phalaris tuberosa* and ryegrasses which can cause "staggers," as well as a number of plants which, under certain conditions may contain dangerous quantities of prussic acid.

The system of presentation followed throughout the book is an excellent one, consisting of a description of the plant with its history followed by an account of its toxicity, the symptoms of poisoning and, where available, the details of feeding tests and other veterinary data.

A series of appendices give much valuable information. Appendix I. gives the distribution of various poison plants throughout the State; Appendix II. lists the cyanogenetic plants occuring in Western Australia; Appendix III. lists the plants causing photosensitivity; and other appendices group the plants according to various symptoms.

There is a comprehensive glossary of botanical and veterinary terms and a well-compiled general index that makes for rapid and easy reference.

Altogether it is a volume in which both the authors and the publishers can take justifiable pride. It is a book that will be appreciated by pastoralists and farmers as well as by botanists, agricultural scientists and members of scientific institutions throughout the world.

It is available at the extremely low price of £2 10s. plus 1s. 9d. postage and may be obtained from the publishers, West Australian Newspapers Ltd., Newspaper House, Perth.

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THORNAPPLE

(*Datura stramonium* L.)

The name thornapple is applied to several related species of *Datura*, a genus which belongs to the same family as the tomato, potato and tobacco. Thornapple is favoured by soils that are moist during the summer. The plants are toxic, the seeds being the most harmful part.

WEEDS of Western Australia

By **G.R.W. MEADLY** M. Sc.
Officer in Charge, Weeds and Seeds Branch

THE THORNAPPLES

(Datura species)

THE name Thornapple is applied to several related species of Datura, a genus belonging to the same family as a number of plants cultivated either for ornament or their commercial value. Among the garden subjects are the petunia, cestrum and schizanthus, while the potato, tomato, capsicum and tobacco are also well known members. The trumpet-flowered shrub referred to by some nurserymen as Brugmansia is D. arborea and a smaller plant, D. metel is also grown in gardens.

Besides these two, five other species of *Datura* occur in Western Australia, one *D. Leichardtii,* is native to the North-West, being found on the flats of the Gascoyne, Minilya and Ashburton Rivers, the remaining four, *D. stramonium, D. tatula, D. ferox* and *D. meteloides* are introduced plants which have become troublesome weeds in some localities. Their country of origin and method of introduction are not known with certainty. It is safe to say, however, that their natural habitat is tropical and includes India and the Americas. The presence of *Datura* seeds in bird seeds and summer crop seeds such as maize and Sudan grass, suggests a likely method of introduction. Packing material may also have been responsible.

The Thornapples now occur in all States of Australia but are most prevalent in New South Wales and Queensland in association with summer rains. This is understandable with summer-growing annuals favoured by warm, moist conditions. In Western Australia they are widely scattered, the species collectively being recorded from localities ranging from the Eastern Goldfields to the metropolitan area and Shark Bay to Albany.

DESCRIPTION

The common name is derived from the large fruit which has somewhat the shape of an apple and is covered with spines which vary in number and size according to the species. The differences between the four weed species are mainly related to the shape of the leaves, the size and shape of the fruit along with the type of spines and the disposition of the fruit. It may be either erect or drooping. The illustrations demonstrate these variations. The following brief description of *D. stramonium,* along with the plates will assist in the identification of the weed species.

The plant is an almost hairless, erect, annual reaching three feet in height. The leaves are pointed-ovate up to six inches in length, with wavy margins and small points at distant intervals. The white funnel-shaped flowers are 3-4 inches long on short stalks which remain erect after the fruits have been formed. The fruit is ovoid, 1½-2 inches long and covered with prominent prickles. It contains many somewhat wrinkled kidney-shaped seeds about ⅛in. in length.

Fig. 1.—COMMON THORN APPLE (Datura stramonium L.): A—Habit; B—Fruit in longitudinal section; C—Fruit; D—Transverse section of fruit; E—Seeds (enlarged).

(From a pen drawing by the Government Botanist, Mr. C. A. Gardner.)

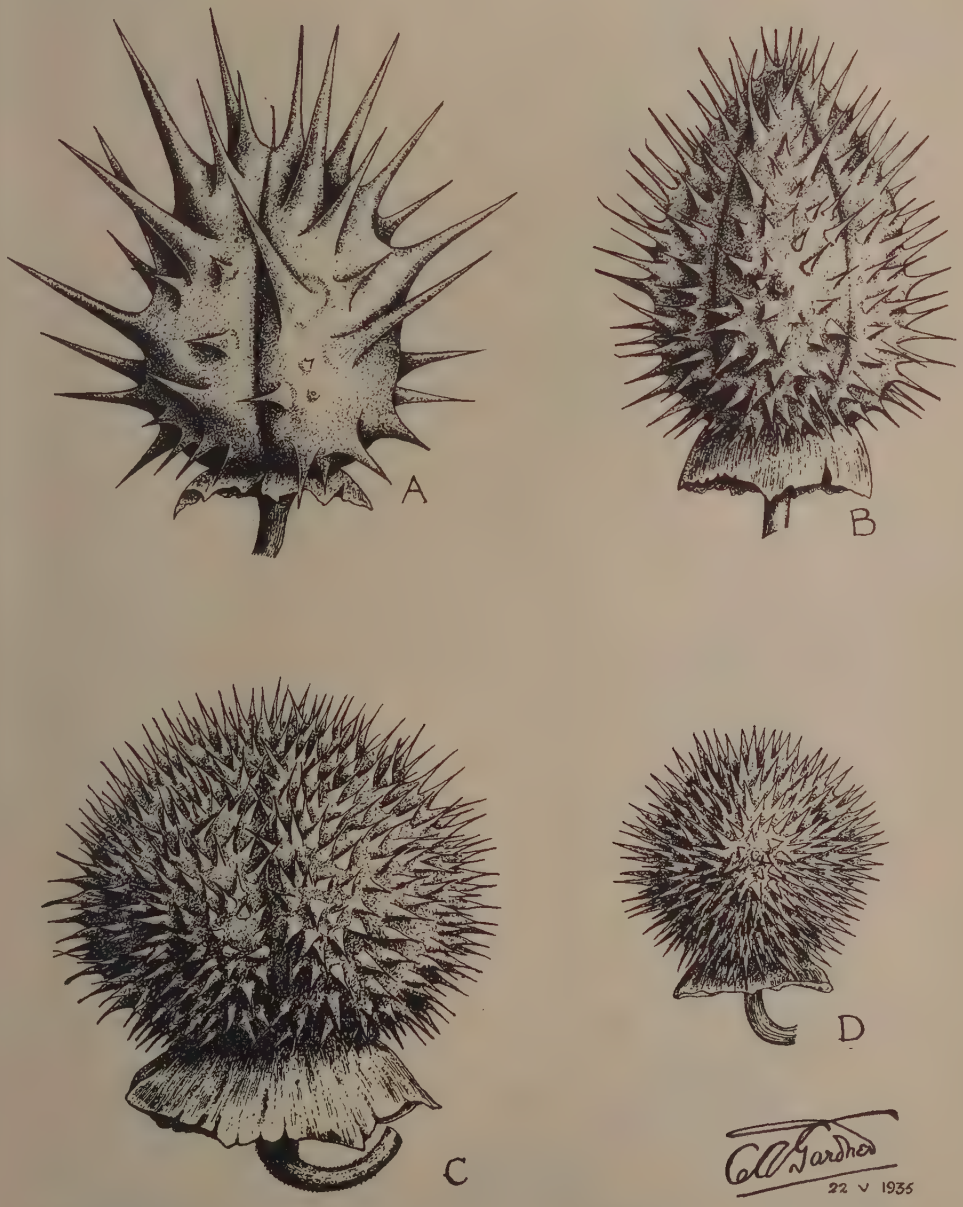

Fig. 2.—FRUITS OF DATURA SPECIES: A—*Datura ferox* L.; B—*D. stramonium* L.. C.—*D. metel* L.; D—*D. Leichhardtii* F. Muell.

(From a pen drawing by the Government Botanist, Mr. C. A. Gardner.)

Fig. 3.—LEAVES OF DATURA SPECIES: A—*Datura metel* L.. B—*D. ferox* L.; C—*stramonium* L.: D—*D. Leichhardtii* F. Muell.

(From a pen drawing by the Government Botanist, Mr. C. A. Gardner.)

SIGNIFICANCE

Being summer-growing annuals, Thornapples are usually found on land that is naturally moist or irrigated during the summer. They are often associated with shallow watercourses, depressions and fallowed land and grow vigorously on flats near Kalgoorlie if moisture is retained during the warm weather.

They compete with crop plants for moisture as well as soil nutrients and the broad, spreading leaves often have a severe shading effect. The toxicity of the plants, particularly the seeds, however, is the most undesirable feature. In very early times medicinal properties were attributed to the plants and Sanscrit writers described them as being beneficial for many ailments including mental derangements, fever, skin diseases and tumours. A pill made from the pounded seeds was placed in a tooth decayed to relieve toothache and the leaves, when smoked, were claimed to be beneficial for asthma.

The alkaloids hyoscyamine, atropine and hyoscine have been obtained from *D. stramonium* and no doubt comprise the toxic principle. There have been cases of poisoning of humans, particularly children, as a result of eating the seeds, some with fatal results. Losses of animals attributed to Thornapples, however, are relatively few. They tend to avoid the plants when grazing, possible because of the disagreeable odour and unpleasant flavour. The risk is probably greatest with contaminated chaff, hay or ensilage, especially if it contains seeds of the weed. Toxic aspects are dealt with fully by C. A. Gardner and H. W. Bennetts—Poison Plants of Western Australia, The Thornapples—Journal of Agriculture of Western Australia Vol. 2. March-April, 1953.

CONTROL

As already mentioned, seeds of Thornapple occur from time to time in seeds imported for both sowing and feeding to birds. The risk of contamination is greatest in the case of summer crops such as Sudan grass, maize, sorghums and sunflower. A close inspection of such lines is carried out before they are distributed and in recent years the quality of imported seed has improved considerably. The dark, kidney-shaped seeds can be detected quite readily with the naked eye.

When plants are located, measures should be taken to prevent seeding. Odd plants can be hand-pulled or hoed, making sure not to scatter seeds from ripe capsules and to destroy by burning, all plants bearing seeds. More extensive infestations should be ploughed before the plants have flowered. Thornapple seeds will retain their vitality for many years, thus necessitating inspections for some time after the last seed bearing plant has been destroyed. Although relatively resistant to the growth-regulating or hormone-like chemicals, Thornapples can be killed by spraying with a solution containing one pound of sodium chlorate in two gallons of water.

FARMERS

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GRUBBING

TREES AND STUMPS

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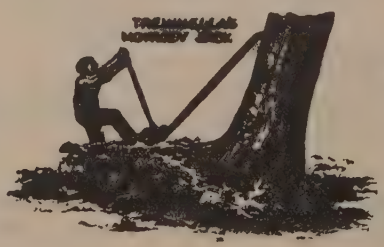

CEREAL VARIETY TRIALS 1955-56

By A. S. WILD, B.Sc. (Agric.), Acting Superintendent of Wheat Farming and
J. REEVES, B.Sc. (Agric.), Plant Geneticist.

AS an important step in the work of bringing new and improved cereal varieties to West Australian farmers, variety trials are carried out each season on the six wheatbelt research stations in this State. This provides a comparison of the performance, under actual field conditions, of recently produced varieties against those now in general cultivation.

Such testing of locally produced and introduced cereal varieties has been a regular feature of the investigational work of the research stations since the first station (Chapman) was established in the cereal growing areas in 1902. Situated as they are at widely distributed centres, the results from the trials assist in determining the varieties which are most suitable for cultivation in the various rainfall zones of the cereal growing areas of this State.

SEASONAL CONDITIONS 1955-56

Rainfall figures for the research stations on which trials were conducted are shown in the following table.

TABLE 1.

Rainfall at Research Stations.

Station.	Feb.	Mar.	Apr.	Growing Period.							Annual Total.
				May.	June.	July.	Aug.	Sept.	Oct.	Total.	
Avondale, 1955	578	49	251	223	89	226	502	117	161	1318	2207
Average 29 years	56	81	90	216	314	295	228	104	81	1238	1571
Chapman, 1955	399	9	146	374	179	420	549	100	188	1810	2383
Average 50 years	44	62	79	235	404	386	262	140	90	1517	1789
Esperance, 1955	315	96	223	94	309	150	230	206	211	1200	2141
Average 6 years	100	57	137	260	234	198	224	265	172	1354	1905
Merredin, 1955	298	35	69	98	84	110	230	297	97	916	1374
Average 45 years	58	88	85	140	182	182	150	83	73	809	1174
Salmon Gums, 1955	374	147	206	119	192	90	219	259	103	982	1847
Average 30 years	94	125	90	128	150	140	145	107	111	781	1333
Wongan Hills, 1955	381	27	99	204	81	161	406	196	98	1146	1832
Average 30 years	52	86	94	189	251	256	200	93	69	1057	1403

All stations received appreciable rainfall in February as a result of a series of cyclonic disturbances affecting most of the State at that time. The early rains enabled land preparation and weed control to be commenced early at some centres and this, together with the consequent increase in subsoil moisture, were possibly contributory factors in the ability of crops to thrive during the general dry period which oc-

Fig. 1.—Variety trial plots at the Wongan Hills Research Station

curred in June and July. During late August and onwards to the end of October, all stations enjoyed good conditions which generally resulted in satisfactory crop yields.

At the Avondale, Chapman and Wongan Hills Research Stations, all the crops were sown on unfallowed clover ley land which had been down to subterranean clover pasture for four or more years prior to 1955. At Merredin and Salmon Gums, the land was fallowed in 1954. The plots at Esperance were on non-fallowed land which was being cropped for only the second time, they received 1 cwt. of sulphate of ammonia in addition to the normal rate of superphosphate.

Seasonal conditions at the individual stations were:—

Avondale Research Station—Beverley:

Rains towards the end of May enabled planting to be carried out under favourable conditions, but in June, this was followed by one of the driest periods on record, which, accompanied by frosts, extended into July and delayed early growth. Heavy rains fell towards the end of July and continued throughout August, but it was not until September that crops began to show improvement. However, ideal conditions during that month and October resulted in generally above-average yields being obtained.

Chapman Research Station—Nabawa:

Adequate rains towards the end of May enabled planting to be carried out under ideal conditions, but a dry period which lasted until late in July, together with cold weather, retarded growth. Heavy rains during August further delayed growth and it was not until the end of that month that crops made much progress. However, ideal conditions in spring caused rapid growth and wheat yields were above average. Wind damage to the oat crops resulted in only average yields being harvested.

Esperance Research Station—Gibson:

The heavy summer rains during February enabled cultivation of fallow to commence earlier than usual and planting was started at the end of April under favourable conditions. However, dry, cold conditions prevailed until the middle of June when useful falls were recorded. Crops made only fair progress until the advent of warmer weather, which, coupled with adequate spring rains, resulted in good growth and satisfactory yields.

TABLE 2.

Wheat Variety Trials at Research Stations, 1955-56 Season.

Variety.	Avondale.			Chapman.			Merredin.			Salmon Gums.			Wongan Hills.			Esperance Plains.		
	Yield Bus./ Acre.	Percent. of Control.		Yield Bus./ Acre.	Percent. of Control.		Yield Bus./ Acre.	Percent. of Control.		Yield Bus./ Acre.	Percent. of Control.		Yield Bus./ Acre.	Percent. of Control.		Yield Bus./ Acre.	Percent. of Control.	
		1955.	Average.		1955.	Average.		1955.	Average.		1955.	Average.		1955.	Average.		1955.	Average.
Midseason Maturing Varieties—																		
Bencubbin	17·4	100	100	20·6	100	100	14·3	100	100	19·3	100	100	33·5	100	100	10·4	100	100
Bencubbin 48	17·4	100	(5) 96	20·7	100	(5) 91	16·6	116	(5) 93	19·6	102	(4) 98	30·7	92	(5) 96	9·6	92	(4) 103
Javelin 48	17·9	103	(4) 105	21·7	105	(4) 97	16·3	114	(4) 104	17·3	90	(3) 92	32·9	98	(3) 95	9·3	89	(3) 95
Kondut	20·2	116	(12) 106	22·4	109	(12) 101	....	....	....	....	....	....	33·1	99	(10) 95	....	....	....
Eureka	20·2	116	(12) 109	21·5	104	(12) 101	....	....	....	20·5	106	(11) 92	33·0	99	(10) 97	9·4	90	(4) 95
Sabre	22·1	127	(2) 110	24·3	118	(2) 109	16·3	114	(2) 103	19·7	102	....	29·5	88	(2) 89	9·3	89	(2) 90
M.114	20·0	115	....	21·7	105	(2) 97	16·0	111	(3) 101	17·7	92	....	31·5	94	(3) 99	....	....	....
Panther	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	8·2	79	(4) 105
Celebration	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	10·2	97	....
Diff. for Sig. P = ·05	2·4	14	....	1·5	7	....	Not significant.			Not significant.			1·7	5	....	1·1	10	....
Early Maturing Varities—																		
Bungulla	19·5	100	100	24·5	100	100	16·8	100	100	16·7	100	100	25·3	100	100	....	....	....
Wongoody	24·0	123	(9) 110	19·6	80	(8) 95	18·6	110	(10) 100	16·7	100	(9) 104	33·6	133	(9) 101	....	....	....
Gabo	33·5	172	(9) 117	25·9	106	(8) 101	14·4	86	(10) 95	16·4	98	(8) 99	36·6	145	(9) 108	....	....	....
Insignia 49	29·3	150	(4) 112	25·7	105	(4) 110	20·6	122	(5) 108	20·1	120	(4) 118	38·4	152	(5) 117	....	....	....
Saga	23·3	119	....	....	....	....	15·7	93	(2) 90	17·1	102	....	26·7	106	(2) 99	....	....	....
M.117	25·5	130	....	24·1	98	....	17·2	102	(2) 98	13·8	82	....	36·2	143	(2) 129	....	....	....
M.118	25·9	132	....	25·1	102	....	17·0	101	(2) 101	15·3	91	....	33·2	131	(2) 123	....	....	....
W.33	25·1	128	....	21·9	89	....	16·9	100	....	13·2	79	....	30·9	122	....	....	....	....
W.34	....	....	....	....	....	....	15·9	94	....	....	....	....	28·6	113	....	....	....	....
Diff. for Sig. P = ·05	2·6	13	....	1·3	5	....	2·7	15	....	1·2	7	....	2·2	9	....	....	....	....

N.B.—Figures in brackets indicate the number of years under trial.

Merredin Research Station—Merredin:

Inadequate rains delayed planting until the end of May and even then poor rains and a severe cold spell retarded germination, which did not occur on the heavy land, where the trials were planted, until late in July. Above-average rains in August and September combined with warmer weather in October, encouraged rapid growth. The late start to the season did, despite a much more extended finishing period than usual, affect yields which for the bulk wheat crops, were slightly below and for oats, about equal to average.

Salmon Gums Research Station—Salmon Gums:

Following the heavy summer rains in February, the fallowed land was scarified, then, owing to weed growth, it was ploughed back again after rains in April with seeding taking place under favourable conditions during May. Rainfall recorded in June was sufficient to keep crops growing during a dry period in July. Above-average falls in August and September and a warm October resulted in yields better than usual for both wheat and oats.

Wongan Hills Research Station—Wongan Hills:

Following the unusual rains during January and February, ploughing of the areas to be cropped was commenced but not completed. Useful rains in April enabled all ploughing operations and cultivation of the area previously ploughed to be completed. Planting was commenced in May, though adequate rains were not received until late in the month. Below average rains during June and July were fortunately followed by above-average falls in August. Very useful rains during September and October coupled with a somewhat extended season, resulted in some outstanding yields being obtained with both wheat and oats. These were the highest ever recorded on the Station being approximately twice the long term average for oats and nearly twice for the wheat crop.

WHEAT VARIETY TRIALS

In Table 2 are presented the yields from the 1955 wheat variety trials. These are expressed directly in bushels per acre and also as percentages of Bencubbin and Bungulla, the control varieties respectively in the early and late planted trials.

It will be noted from the table that trial yields for all stations were very satisfactory, being above the long-term station averages. Those obtained at Wongan Hills were particularly outstanding, the overall average for all varieties being 32.1 bushels per acre.

TABLE 3.

Characteristics of Varieties Under Trial.

Variety.	Produced by.	Maturity.	Stem Rust Resistance.	Flag Smut Resistance.	Grain Quality.
Bungulla	W.A. Dept. of Agriculture	Very early	Susceptible	Resistant	F.a.q.
Bencubbin	W.A. Dept. of Agriculture	Mid-season	Susceptible	Resistant	F.a.q.
Kondut	W.A. Dept. of Agriculture	Late mid-season	Susceptible	Resistant	Medium-strong
Wongoondy	W.A. Dept. of Agriculture	Early	Susceptible*	Resistant	Nearly strong
M.114	W.A. Dept. of Agriculture	Mid-season	Resistant	Highly resistant	Medium-strong
M.117	W.A. Dept. of Agriculture	Early	Resistant	Highly resistant	Above f.a.q.
M.118	W.A. Dept. of Agriculture	Early	Resistant	Highly resistant	Above f.a.q.
W.33	W.A. Dept. of Agriculture	Early	Resistant	Highly resistant	Medium-strong
W.34	W.A. Dept. of Agriculture	Early	Resistant	Highly resistant	Medium-strong
Eureka	N.S.W. Dept. of Agriculture	Mid-season	Susceptible*	Highly resistant	Nearly strong
Celebration	N.S.W. Dept. of Agriculture	Late mid-season	Resistant	Resistant	Nearly strong
Insignia 49	Waite Institute	Early	Resistant	Mod. resistant	F.a.q.
Javelin 48	Waite Institute	Mid-season	Resistant	Resistant	Medium-strong
Bencubbin 48	Waite Institute	Mid-season	Resistant	Resistant	F.a.q.
Panther	Waite Institute	Late mid-season	Resistant	Resistant	Medium-strong
Gabo	Sydney University	Early	Resistant	Susceptible	Nearly strong
Saga	Sydney University	Early	Resistant	Resistant	Nearly strong
Sabre	Roseworthy College	Mid-season	Resistant	Resistant	Medium-strong

* Wongoondy and Eureka resistant to one rust race (126) found in Western Australia.

Midseason Varieties for Early Planting:

Kondut and Eureka continued to give satisfactory yields under the influence of higher rainfall at Avondale and Chapman. Because of their yielding ability, straw strengh and good flour quality, these two varieties are very suitable for early sowing in the higher rainfall areas of the wheat-belt.

In comparison, Sabre gave higher yields on the same two stations. It also yielded well at Merredin and Salmon Gums, where favourable seasonal conditions resulted in a better performance than in the previous year when the yields of this variety were somewhat lower. This new wheat obtained from Roseworthy College in South Australia, will be included in future trials as it promises to be suitable for the better rainfall areas.

The Merredin crossbred M.114 (Eureka 2 x M.60 (Sword x Kenya C.6041)) also yielded well and this year's results tend to confirm its earlier promise. In three years' trials at Merredin and Wongan Hills it has, on the average, been equal to Bencubbin. It has the added advantages of producing medium strong flour equal to Kondut, rust resistance and good straw strength. Subject to confirmation by further tests, it could prove a useful new variety and a replacement for Bencubbin and Bencubbin 48.

Last season Bencubbin 48 gave yields equal to or slightly better than Bencubbin, except at Wongan Hills and Esperance. On the latter Station, it has, over a period of four seasons, given yields slightly more than the control variety, but average yields on all other stations have been below the control. Bencubbin 48 may therefore be recommended, in preference to Bencubbin, only because of its rust resistance.

This season Panther yielded very poorly at Esperance, which was unusual as, in previous years, yields of this variety have been exceptionally good at this centre. Celebration gave a yield only slightly below the control and is worthy of further trial. Due to the fairly frequent occurrence of rust on the Esperance Downs, varieties must possess rust resistance and both Panther and Celebration (which are resistant to all races of rust known to be present in this State) could therefore be of value in this area, providing their performance in other respects is satisfactory.

Early Varieties for Late Planting:

Owing to the extended season and late spring rains at Avondale and Wongan Hills, the control variety Bungulla lodged rather badly. This accounts for its relatively low yields at these two centres. It is similar to Bencubbin in flour quality and reaction to disease, and it is intended to omit both varieties from future variety trials.

At Merredin, Salmon Gums and Wongan Hills, Insignia 49 was the highest yielding variety. This variety has consistently given better yields than any other variety

Fig. 2.—Developing new varieties by cross-breeding at the Merredin Research Station

at these three centres, and it is also slightly superior to Bungulla in flour strength. It is therefore recommended for sowing in the medium to low rainfall areas of the wheatbelt.

Insignia 49 is not recommended for sowing in the higher rainfall areas as trials at Avondale indicate that Gabo and Wongoondy are more suitable for these and similar districts. The two latter varieties are better than Insignia 49 in flour quality and where farmers in both high and low rainfall areas are desirous of growing only varieties of high flour quality, Gabo and Wongoondy are recommended for late plantings.

The variety Saga has given relatively low yields over the past two years and appears unsuitable for growing in this State.

Two cross-breds M.117 and M.118 produced at Merredin from the crosses Charter x (Bungulla) 2, were under trial for the second time at Merredin and Wongan Hills. Whilst these gave satisfactory yields, both are being discarded because of their flour quality.

The other cross-breds W.33 and W.34 were under test for the first time. They were developed at Wongan Hills, W.33 from a cross between Gluclub and Charter and W.34 from the cross M67 x Charter, M67 = (Genoa x Gluyas Early) Pusa IV. W.33 is a club-eared variety, bred as a replacement for Gluclub. Yields obtained in 1955 from W.33 and W.34 were not particularly high, but they will be included in future trials because of their good flour quality and satisfactory disease resistance.

In the light of results of trials conducted to date, the recommendations for wheat varieties for the three major zones of the wheatbelt are listed in Table 4.

TABLE 4.

Recommended Wheat Varieties.

Maturity.	Zone 1 (Early). Less than 14 in. annual rainfall.	Zone 2 (Mid-season). 14 in. to 18 in. annual rainfall.	Zone 3 (Late). Above 18 in. annual rainfall.
Mid-season and late mid-season	Bencubbin 48	*Kondut *Eureka Bencubbin 48	*Kondut *Eureka Bencubbin 48
Early	Insignia 49 *Wongoondy *Gabo	*Gabo *Wongoondy Insignia 49	*Gabo *Wongoondy

* Varieties capable of producing flour of medium to high quality.

OAT VARIETY TRIALS

Yields from the 1955 oat variety trials are set out in Table 5. Returns were exceptionally high at Wongan Hills and above average at Avondale and Salmon Gums.

In the early planted trial with mid-season and late maturing varieties, Avon was the best yielder. This variety, which was released for general cultivation last

TABLE 5.

Oat Variety Trials at Research Stations, 1955-56 Season.

Variety.	Avondale. Yield Bus./ Acre.	Avondale. Percent. of Control. 1955.	Avondale. Percent. of Control. Average.	Chapman. Yield Bus./ Acre.	Chapman. Percent. of Control. 1955.	Chapman. Percent. of Control. Average.	Merredin. Yield Bus./ Acre.	Merredin. Percent. of Control. 1955.	Merredin. Percent. of Control. Average.	Salmon Gums. Yield Bus./ Acre.	Salmon Gums. Percent. of Control. 1955.	Salmon Gums. Percent. of Control. Average.	Wongan Hills. Yield Bus./ Acre.	Wongan Hills. Percent. of Control. 1955.	Wongan Hills. Percent. of Control. Average.
Early Planted Trial—															
Dale	37·2	100	100	....	....	100	....	....	100	34·3	100	100	56·1	100	100
Avon	48·8	131	(3) 133	....	....	(2) 119	....	....	(1) 100	....	....	(1) 110	60·0	107	(3) 116
Algerian	33·0	89	(3) 86	....	....	....	....	....	....	29·0	85	(3) 95	51·0	91	(3) 88
Late Planted Trial—															
Ballidu	27·2	100	100	18·7	100	100	18·4	100	100	27·3	100	100	59·2	100	100
Orient	32·8	121	(2) 113	16·3	87	(4) 112	17·4	95	(6) 106	28·2	103	(3) 111	51·8	87	(5) 100
Kent (W.30)	27·9	103	(2) 106	13·1	70	(4) 96	15·8	86	(4) 99	28·6	105	(3) 107	50·2	85	(3) 88
Wongan	28·8	106	(2) 123	21·7	116	(4) 106	15·5	85	(6) 86	23·8	87	(3) 95	50·4	85	(5) 86

N.B.—The figures in brackets indicate the number of years under trial.

year, is recommended for the higher rainfall areas of the wheatbelt as it has proved to be consistently high yielding, possesses strong straw and does not shed. In addition, the seed is white and normally awnless and is usually long and thin, except when grown under very favourable conditions.

Algerian generally yielded well below either Dale or Avon and is therefore recommended for sowing only in the higher rainfall areas. It is particularly suitable for the dairying districts where a late maturing variety is required because of the long growing period.

In the late planted trial with early and very early maturing varieties, the crossbred W.30 gave satisfactory yields except at Chapman, in comparison with Ballidu. As it also yielded well in previous trials, W.30 has been named Kent and pedigree seed is being distributed for planting by farmers during the 1956-57 season. Kent has a large, plump, awnless grain, light brown in colour and of high bushel weight. It is also a satisfactory variety for green fodder purpose, particularly for early grazing as it gives a large bulk of material very early in the season. After grazing it recovers well for grain yields.

Neither Orient nor Wongan will be included in future variety trials as it is considered that Ballidu and Kent are better varieties for both grazing and grain production.

The recommendations for oat varieties are listed in Table 6.

TABLE 6.

Recommended Oat Varieties.

Maturity.	Zone 1. Less than 14 in. annual rainfall.	Zone 2. 14 in. to 18 in. annual rainfall.	Zone 3. Over 18 in. annual rainfall.
Late	....	....	Algerian
Mid-season	Dale Avon	Avon Dale	Avon Dale
Early	Ballidu Kent	Ballidu Kent	Ballidu Kent

As there is at present a strong overseas demand for oat grain, further information is being obtained on whether Kent and Avon are as suitable as Ballidu and Dale for the export trade. It is expected that these two new varieties will prove acceptable to both local and overseas buyers who require oats for maunfacturing purposes. In this respect Kent should be particularly suitable.

BARLEY VARIETY TRIALS

Usually results of the barley variety trial at Avondale are included in this article each year, however, due to unsatisfactory conditions during the planting of the trial, no results are available from this Station.

A trial was however carried out at the Pilot Farm at Newdegate with the four varieties, Prior (2-row), Maltworthy (2-row), Beecher (6-row) and Atlas (6-row), the yields being as follows:—

Variety.	Yield (bus./acre.)	%
Prior	16.1	100
Maltworthy	17.1	106
Beecher	18.6	116
Atlas	15.8	98
Diff for sig. (P = .05)	1.8	11

In this trial Beecher significantly outyielded both Prior and Atlas. This may, in part, have been due to it being less affected by powdery mildew than the other varieties, however, previous trials at Avondale indicate that Beecher is at least equal in yield to Atlas, if not better.

TABLE 7.

Recommended Barley Varieties.

Use.	Zone 1. Less than 14 in. annual rainfall.	Zone 2. 14 in. to 18 in. annual rainfall.	Zone 3. Over 18 in. annual rainfall.
For Malting— Local Trade	....	Prior Maltworthy*	Prior Maltworthy
Export Trade	....	Atlas Beecher	Atlas Beecher
For Fodder, Grazing, Grain	Atlas Beecher	Atlas Beecher	Atlas Beecher

* Higher rainfall areas of this zone.

THE FLOUR STRENGTH OF WHEAT VARIETIES

CONTRIBUTED BY THE WHEAT AND SHEEP DIVISION

OVER ninety different wheat varieties are planted commercially in Western Australia each year. Many of these however are grown in such small amounts that they have no effect on the flour quality of each season's harvest.

In the following table, the more important varieties are sub-divided into four groups according to their flour strengths as determined when grown on research stations and tested in the cereal research laboratory.

Strong: Charter, Festival, Yalta.

Medium-strong: Baldmin, Dirk, Dirk 48, Dundee, Eureka 2, Ford, Gabo, Gular, Javelin, Javelin 48, Kendee, Kondut, Rapier, Ridley, Sabre, Saga, Scimitar, Warigo, Wongoondy.

Weak: Baroota Wonder, Bencubbin, Bencubbin 48, Bobin, Bungulla, Canberra, Dan, Devon, Dowerin, Federation, Geeralying, Golden King, Gresley, Insignia, Insignia 49, Koorda, Merredin, Nabawa, Pinnacle, Ranee 4H, Regalia, Sword.

Very Weak: Bluclub, Clubhead, Gallipoli, Gluclub, Gluyas Early, Magnet, Marathon, Noongaar, Quadrat, Totadgin, Waratah.

The strong group are the true "premium" varieties, however, most varieties in the medium strong class when grown under suitable conditions of soil and climate are also capable of producting "premium" grade flours.

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AUSTRALIAN TRACTOR TESTS

REPORT ON TEST No. 25 (Farmers' Edition)

NEW FORDSON MAJOR—KEROSENE MODEL

TESTED FOR THE FORD MOTOR COMPANY OF AUSTRALIA, GEELONG.

THIS Report is taken from the full Technical Report No. 25 of this test; test results are shown here in briefer form; fuller explanations are added. Values quoted here may be rounded out to two instead of three significant figures; to this extent the values quoted may differ slightly but not significantly from those shown in the Technical Report. Graphs of belt test performance, shown in the Technical Report, are not shown here. The Technical Report is not available in large numbers, but may be seen at the offices of the State Departments of Agriculture, the Bureau of Sugar Experiment Stations (Queensland), and the Commonwealth Department of Primary Industry.

1. THE TESTS

(1) After 12 hours of running-in, two types of tests were carried out, in order to measure *the performance of the engine*, as measured by the power in the belt driven

The Australian Tractor Testing Committee is a joint body established by agreement between the Commonwealth, the States, and the University of Melbourne; under this agreement, the tests are carried out by the University of Melbourne. The address of the Tractor Testing Committee is—C/o Department of Primary Industry, 301 Flinders Lane, Melbourne.

by the belt pulley, and *the performance of the tractor as a whole,* as measured by drawbar pull, tractor speed, wheel slip, and drawbar horsepower (d.b.h.p.), with the tractor running on a bitumen test track.

The main results of these tests are given in Sections 2, 3 and 4. Other measurements and observations were made of various features of the tractor; these are given in Section 5.

(2) **Fuel-Mixture Settings.**—The engine of this tractor has only one fuel-mixture setting, at which all the tests were carried out.

(3) **Governor Control.**—For maximum loads the throttle was full open; for part loads the governor control was set to give rated speed at the desired loads.

(4) **Fuel.**—Power Kerosene, Octane No. 56; Specific Gravity 0.829; weight per Imperial gallon 8.29 lb.

(5) **Specification.**—Engine No. 1273097. For a brief specification of this tractor see Section 6, at the end of this report.

2. SUMMARY OF POWER OUTPUT

Table A.

——	At the Belt.	At the Drawbar.
Rated engine speed, r.p.m.	1,600	1,600
Corrected maximum power (*a*)	32·3	29·0
Rated power (*b*)	27·5 (*b*1)	21·8 (*b*2)

Note.—Letters in brackets inside the tables refer to explanatory footnotes.

(*a*) Corrected maximum h.p. for carburettor engines is calculated by a suitable formula from observed maximum h.p. corrected to 60° F. and 29·92″ (sea level) barometric pressure.

(*b*) Engines are not expected to run indefinitely at full or maximum power output. But they can be expected to run continuously for some hours at *rated* output, which is less than maximum, defined as follows :—

(*b*1) Rated b.h.p. is defined as 85 per cent. of corrected maximum b.h.p. ;

(*b*2) Rated d.b.h.p. is defined as 75 per cent. of corrected maximum d.b.h.p.

3. BELT TESTS

The belt tests show the power (belt horsepower, b.h.p.) that the tractor may be expected to deliver when driving a machine by the belt.

TABLE B—BELT TEST RESULTS.—

If there is only one fuel setting, no mention will be made of mixture settings in this table.

	B.H.P.	Engine Speed.	Fuel. Gall./hr. (*c*).	Fuel. lb./b.h.p. hr. (*d*).
1. Rated engine speed, 1,600 r.p.m. 2. Fast idling speed, about 1,720 r.p.m.				
3. Observed maximum b.h.p. at rated speed	31·8	1,599	2·75	0·72
4. Corrected maximum b.h.p. rated speed (*a*)	32·3	Observed maximum value corrected for atmospheric temperature and pressure at time of test.		
5. Calculated rated load (*b*1)	27·5			
6. Test at approximately rated load*	27·0	1,603	2·54	0·78
7. Average reading under governor (*e*)	17	1,640	2·1	1·0
8. Equivalent engine torque at full throttle	104 ft. lb. at maximum power and rated speed 125 ft. lb. (maximum) at 986 r.p.m.			

* Governor set to run this test at approximately rated speed.

(*c*) Fuel consumption in gallons/hr. may be a simple unit, but it has little meaning unless we also quote the corresponding h.p. output.

(*d*) This is the "specific fuel consumption," the weight of fuel consumed per unit of energy developed by the engine ; the unit of energy here is the h.p.-hr., similar to the electrical "unit," the kilowatt-hr. When this figure is least the engine is giving its best economy or efficiency. It is easy to change from column (*c*) to column (*d*) in Table B., e.g., as follows :—

2·75 galls./hr. while developing 31·8 h.p. means 2·75÷31·8 gall./b.h.p./hr. = 0·087 gall./b.h.p./hr.

0·087 gall./b.h.p./hr. x 8·29 lb./gallon for this fuel = 0·72 lb./b.h.p./hr., as shown in column (*d*).

(*e*) Line 7, Table B, represents the average performance one might expect from the engine while driving a variety of belt loads, from light to heavy. In terms of average fuel consumption, it means about 2 to 2½ gallons an hour.

4. DRAWBAR TESTS

(1) The following Tables C, D and E show the drawbar performance of the tractor, on the bitumen test track, wearing rear tyres 14 x 28, carrying standard weight (1,930 lb. front, 5,380 lb. rear; total, 7,310 lb.), working in the gears named in the tables. Height of drawbar 14½ inches.

Drawbar tests, using minimum weight of tractor were carried out, but are not reported here.

If there is only one fuel setting, no mention will be made of mixture settings in these tables.

TABLE C—MAXIMUM POWER IN RATED (3rd) GEAR

	DBHP. (*f*).	Pull lb.	Speed m.p.h.	Wheel Slip % (*g*).
1. Rated engine speed, 1,600 r.p.m.				
2. Observed maximum d.b.h.p., at rated engine speed	29·2	3,160	3·46	7
3. Corrected maximum d.b.h.p., at rated engine speed (*a*)	29·0	Observed maximum value above, corrected for atmospheric conditions at time of test.		
4. Calculated rated load (*b*2)	21·8			

TABLE D—PULL AT MAXIMUM D.B.H.P. All gears, rated engine speed (see note (*h*)).

Gear.	D.B.H.P.	Pull lb.	Speed m.p.h.	Wheel Slip %
			m.p.h.	%
1	24	5,400	1·7	20
2	29	4,170	2·6	10
3	29	3,160	3·5	7
4	29	2,190	5·0	4
5	28	1,500	7·1	2
6	20	580*	13·0	½

* The accuracy of the drawbar dynamometer at this load is suspect.

(*f*) D.B.H.P. is the product of pull (lb.) and speed (m.p.h.) divided by 375.

(*g*) Wheel slip can be measured by noting that, in travelling a given distance, the back wheels make more turns when working under load than when running with no load on the drawbar. The difference in these revolution counts divided by the former count gives the slip as a ratio, which can be written as a percentage (quoted in these tables to the nearest whole number).

(*h*) These are not the maximum pulls available in the gears (i.e., not the maximum sustained pulls), but the pulls at maximum d.b. power, i.e., at full throttle at rated engine speed.

TABLE E—VARIOUS LOADS IN RATED (3rd) GEAR.*

Pull. lb.	Speed. m.p.h.	DBHP.	Per cent. of Maximum d.b.h.p.	Slip. %	Fuel. Gall./ hr.	Fuel. lb./ d.b.h.p. hr.
1,320	3·50	12	42	2	1·9	1·25
1,830	3·54	17	60	3	2·1	1·00
2,320†	3·55	22†	76†	3	2·3	0·87
2,820	3·54	27	92	4	2·6	0·79

* Governor set to run these tests at approximately rated engine speed.

† Approximately the rated drawbar load.

(2) INTERPRETATION OF DRAWBAR TESTS.

(i) Drawbar tests are carried out on a hard prepared surface. Most field conditions present higher resistance to the tractor's motion, so that, in the field, the maximum drawbar pulls available in any gear will usually be less than those shown in the tables.

(ii) Wheel slip may also be greater in the field; to that extent tractor speeds in miles per hour in the field will be less than those shown in the tables.

(iii) Because of (i) and (ii) above, the drawbar horsepowers available in any gear in the field will usually be less than those shown in the tables.

5. OTHER OBSERVATIONS

(1) **Duration of Test.**—68 hours, including running-in.

(2) **Repairs and Adjustments.**—It was necessary to bend arm from governor to throttle valve to ensure extreme throttle opening.

(3) **Engine.**—

Fuel settings—one only.

Heat controls—radiator; hand-controlled shutter; vaporiser.

Radiator water used—none.

Lubricating oil—type used:—S.A.E. 30.

Weight to engine, 15.4 lb.;

Weight from engine after tests, 17.7 lb.

(4) **Inspection of Engine and Transmission after Test.**—After testing, the tractor was partly dismantled and inspected and found to be in a satisfactory condition.

(5) **Tractor Weights (lb.).**—

——	Front.	Rear.	Total.
*Minimum weight, unballasted	1,910	4,420	6,330
Added weights	....	....	....
Water ballast	....	980	980
†Standard weight, as usually supplied and recommended	1,930	5,380	7,310

* This weight, less driver, was used in finding centre of gravity.

† Weight of tractor in drawbar tests quoted in this report.

(6) **Wheels and Tyres.**—

Tyres.	Front.	Rear.
Type	Rib	Open centre bar tread
Size	7·50 x 16 x 6 ply	14 x 28 x 6 ply
Pressure	25 psi.	14 psi.

(7) **Steering**, with track widths, front 54", rear 60"—

Turning circles: Without brakes, 28½' L. H., 27½' R.H.; with brakes, 25½' L.H., 25' R.H.

Comment: The tractor was easy to steer with the steering wheel while under load.

(8) **Centre of Gravity**, with tractor in minimum weight less driver.—Height above ground 2' 4". Distance forward of rear axle, 2'.

G. H. VASEY,
Officer in Charge, Tractor Testing.

I. T. NAYLOR,
Tractor Testing Officer.
University of Melbourne, 10/9/54.

6. BRIEF SPECIFICATIONS

New Fordson Major Kerosene
(Supplied by Manufacturers)

(1) **Engine**—No. 1273097 (Ford, England). 4-stroke; 4 cylinders, vertical crankshaft along tractor.

Bore, 3.937"; stroke, 4.528"; compression ratio, 4.62 : 1.*

Rated speeds: belt work, 1,600 r.p.m.; drawbar work, 1,600 r.p.m.

Fuel type: Power kerosene.

Fuel system: Mechanical fuel pump and fixed jet carburettor. Tank capacity, 14 gallons plus 1 gallon petrol tank.

Air cleaner: Oil bath.

Governor: Mechanical.

Electrical and Ignition system: 12-volt battery, generator, coil.

Starting: 12-V electric; petrol fuel.

Cooling: Water pump and fan; radiator shutters.

Exhaust: "Yuba" type combined muffler and spark arrester.

Lubrication: Oil pump and full flow filter.

(2) **Chassis**—

4-wheel; pneumatic tyres.

Wheel base, 80".

Track width: Front 54", rear 60", both adjustable.

Tyre sizes: front 7.50 x 16; rear 14 x 28.

Steering gear: recirculatory ball.

Weight: Maximum weight, 7,310 lb. (See "Other Observations," Section 5.)

(3) **Belt Pulley**—

Standard; right side, clockwise rotation.

Diameter: 8½"; face width 6½".

Pulley speeds (at rated engine speed), 890 and 1,600 r.p.m.

Belt speeds (at rated engine speed), 1,980 and 3,560 ft./min., not in accordance with overseas standards (namely, 3,100 ± 100 f.p.m.).

(4) **Power Take-off**—

Standard; guarded; location, centre rear.

Speed (at rated engine speed): 723 r.p.m., not in accordance with overseas standards (namely, 536 ± 10 r.p.m.).

Dimensions: 6-spline, $1\frac{3}{8}$" diameter.

(5) **Drawbar**—Swinging.

Height as tested: $14\frac{1}{2}$", adjustable.

(6) **Transmission**—Conventional Gears.

Clutch: Single dry plate, 11" dia., pedal control.

Gear ratios and road speeds (assuming no wheel slip) on 11.00 x 36 tyres, at rated engine speed, as advertised:—

Gear.	Forward.						Reverse.	
	1	2	3	4	5	6	Low.	High.
Ratio	123	87·3	68·4	48·6	34·8	19·3	91·1	50·7
Speed, m.p.h.	2·1	2·9	3·7	5·2	7·3	13·2	2·8	5·0

(7) **Hydraulics**—Optional, not fitted.

(8) **Three-Point Linkage**—Optional, not fitted.

* Engine tests with a cylinder head giving a compression ratio of 5.5 to 1 were carried out (Test No. 25A), but are not reported here.

THE NUFFIELD FOUNDATION

TRAVELLING SCHOLARSHIPS FOR AUSTRALIAN FARMERS

1. The Nuffield Foundation, with the object of promoting a better understanding between farmers of Australia and Great Britain and increasing practical farming knowledge, including horticultural knowledge, will award two travelling scholarships in 1956, to farmers in Australia to enable them to study farming practice and conditions of agricultural life in Great Britain. Upon return to Australia it is hoped they will be able to spread the knowledge and understanding they have gained among their farmer and other neighbours.

2. The scholarships will be awarded by the Nuffield Foundation on the recommendation of the Foundation's Australian Advisory Committee.

3. The scholarships are tenable for not less than six months. It is considered that a shorter period would result in incomplete study. In general, the scholars will be expected to arrive in the United Kingdom in February, 1957.

4. The scholarships are open to persons of either sex who are citizens of Australia, **who are now engaged and intend in future to engage in farming in Australia,** and who are persons likely to be able to spread their knowledge and experience upon their return to Australia. In making the awards, regard will be paid to the value of the experience which the applicant could gain in the United Kingdom. Applicants should be not less than 25 and not much more than 35 years of age.

5. The Nuffield Foundation, in consultation with the National Farmers' Union in the United Kingdom, will make arrangements to ensure that each scholar is placed initially and thereafter during his scholarship with progressive practical farmers in the United Kingdom whose farming interests correspond with those of the scholar and whose knowledge of agriculture in the United Kingdom generally is comprehensive.

6. The value of each scholarship will be adjusted to meet the scholar's needs and circumstances generally, but will be sufficient to meet reasonable expenses in the United Kingdom.

Travelling expenses (by air if necessary) from the scholars' farms to Great Britain, in Great Britain, and back to their farms in Australia will be paid by the Foundation in addition to the Scholarship award.

7. During the tenure of award a scholar will be required to devote the whole of his or her time to a course of practical study approved by the Foundation.

Other work, paid or unpaid, may not be undertaken during the period of the Scholarship without the permission of the Trustees.

8. The Foundation's Australian Advisory Committee will, where necessary, assist the scholar in making arrangements to ensure that his farming business is properly looked after during his absence.

9. A scholar will be expected to resume residence in Australia on the completion of his or her scholarship.

10. A scholar will be required in consultation with the Australian Advisory Committee to write notes on his work in the United Kingdom and submit them to the Foundation's Australian Advisory Committee after returning to Australia.

11. Should the Trustees of the Nuffield Foundation at any time find that a scholar neglects or has neglected the obligations implicit in the scholarship award, they shall have power immediately to terminate the scholarship.

12. In 1956 scholarships are being offered to residents of the Northern Territory, South Australia and Western Australia. In 1955, scholars were selected from the Australian Capital Territory, New South Wales and Queensland.

Applications for scholarships should be submitted to the Secretary of the Nuffield Foundation Australian Advisory Committee, c/o. University of Melbourne, Carlton, N.3, Victoria, from whom application forms may be obtained. Applications for the present awards will close on the 20th July, 1956.

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Fig. 1.—Poor pasture growth resulting from potassium deficiency. Subterranean clover is almost entirely restricted to dung patches

POTASSIUM FOR SUBTERRANEAN CLOVER

By E. N. FITZPATRICK and T. C. DUNNE, Plant Research Division

THERE are a number of areas in the south-western portion of the State where, although adequate quantities of superphosphate and trace elements have been applied, the growth of pasture species, particularly subterranean clover, has declined. In some cases, subterranean clover has disappeared completely. Investigations have shown that in many instances the decreased production is due to potassium deficiency.

Improvement in the growth of pasture plants was obtained by using fertiliser containing potassium on the south coast at Quarram and Denmark in 1932, but no benefits from potash manuring were noted in experiments conducted in the lower South-West. Many years later (1947), considerable improvement in clover growth followed the use of potash fertiliser on a property at Margaret River. A heavy dressing of cow manure, presumably because of the potassium it contained, was also beneficial.

Experiments during the next few years were aimed at determining the minimum amount of potash fertiliser needed to rejuvenate declining pastures. With a view to economy, the rates of application included some very low ones.

In some cases, definite improvement in growth was obtained but the responses were erratic and often did not persist into the second season.

A typical result is shown in Table 1 below.

TABLE 1.

Carbanup (Mr. T. Carter's property).

Hay yields—cwt. per acre.

Muriate of Potash Per Acre.	Total Yield Per Acre.	Clover Per Acre.
Nil	20.7	4.4
25 lb.	25.0	8.2
50 lb.	27.0	8.6
100 lb.	29.4	10.5

Because of the persistence of potassium deficiency in the experimental areas and the low potassium contents of clover, even on plots to which some potassium had been added, a preliminary trial with a dressing of muriate of potash (60 per cent. K_2O) at 200 lb. per acre was made in 1953. The improvement in growth was so marked that trials using a more extensive

Fig. 2.—A typical response at Margaret River to an application of 224 lb. of muriate of potash. Both plots were reseeded with clover but no potash fertiliser was used on the plot on left

range of rates were begun in 1954. To ensure that there were sufficient clover plants present to respond to manuring treatments, the areas were reseeded. The data obtained from an area where an outstanding response was obtained is shown in Table 2 below.

TABLE 2.

Vasse (Mr. R. Reading's property).

Yields—cwt. per acre dry weight.

Muriate of Potash per Acre.	Total Yield.	Clover Yield.	Protein Yield.
Nil	23·8	0·1	2·1
112lb.	34·1	15·6	4·8
224lb.	43·2	28·3	7·2
336lb.	43·2	30·4	7·4
448lb.	41·0	30·7	7·5

Taking the 224 lb. per acre of muriate of potash as giving the maximum yield, the outstanding points of the results are—

(1) The disappearance of clover from the no potassium plots even though they were reseeded.

(2) An increase of 19.4 cwt. per acre of hay.

(3) An increase of 28.2 cwt. per acre of clover.

(4) As a result of the clover increase, an increase of 5.1 cwt. per acre of protein.

The importance of the clover increase is apparent in that it provides added protein in the feed and hay. In addition, vigorous clover causes increased soil nitrogen and consequently increased production of associated annual grasses.

Similar trials were conducted at Elgin (Mr. C. B. Wells' property) and at Margaret River (Mr. N. L. Smith's property). The results obtained from these trials are shown in Table 3.

TABLE 3.

Yields—cwt. per acre dry weight.

Muriate of Potash per Acre.	Margaret River.		Elgin.	
	Total Yield.	Clover Yield.	Total Yield.	Clover Yield.
Nil	24·2	8·0	19·4	2·2
224lb.	34·3	25·9	31·2	21·4

The clover increases are obvious. The response at Margaret River is shown in Fig. 2 and that at Elgin in Fig. 3.

On another property at Margaret River (Mr. A. Zanni's), where potassium deficiency was not so acute, near maximum results were obtained with 112 lb. per acre of muriate of potash and there was a substantial improvement with 56 lb. per acre. The data obtained is shown in Table 4.

TABLE 4.

Margaret River (Mr. A. Zanni).

Yields—cwt. per acre dry weight.

Muriate of Potash Per Acre.	Total Yield.	Clover Yield
Nil	21.9	13.3
56 lb.	32.7	23.1
112 lb.	34.4	27.7
168 lb.	36.5	28.4
224 lb.	38.7	31.4

WHY POTASSIUM DEFICIENCY DEVELOPS

It has been known for many years that the potassium content of many of the soils in the south-western part of the State is very low. Chemical data obtained from soil surveys in recent years has shown that it was inevitable that potassium deficiency would develop under any system of farming which involved the removal of substantial quantities of potassium.

The potassium content of pasture plants is such that the removal of meadow hay from a paddock robs the area of a substantial amount of potassium. Dairying in Western Australia does, of necessity, entail the making of meadow hay and its removal from paddocks. As the hay is seldom fed back on the area from which it came, the potassium it contains is usually permanently lost.

The quantity lost varies of course with the tonnage and potassium content of the hay, but a two ton crop of clover hay can contain from 35 lb. to 75 lb. of potassium (equivalent to 70 lb. to 150 lb. of muriate of potash).

The potassium in the soil which is available to plants cannot be accurately determined but a chemical analysis for that portion known as "exchangeable" potassium is quite a good guide. Data obtained from soil surveys and other sources show that the "exchangeable" potassium in the top nine inches of the soils which predominate in the Elgin, Vasse and Margaret River areas is low and varies from 80 lb. to 500 lb. per acre.

Fig. 3.—An area at Elgin reseeded with subterranean clover at 25 lb. per acre. Without potash fertiliser (left) no clover plants have survived

Fig. 4.—Subterranean clover showing potassium deficiency symptoms—leaf scorch prominent

Not all of this "exchangeable" potassium is necessarily available to plants. It becomes obvious that a succession of hay crops each of which might remove 35 lb. to 75 lb. of potassium per acre would soon reduce the soil content to a level where the growth of healthy pastures would no longer be possible.

SYMPTOMS OF POTASSIUM DEFICIENCY OF SUBTERRANEAN CLOVER

Potassium deficiency of subterranean clover is most readily diagnosed in the late spring, at the time of rapid clover growth. While clover is still present in the sward, a mild deficiency may show up as patchy growth—with some areas growing normally while others grow slowly if at all—giving a wavy appearance to the pasture.

In instances of more severe deficiency, the clover plants may be only sparsely scattered throughout the pasture. In such cases, the only healthy clover is usually associated with dung patches from which it derives sufficient potassium for normal growth. The typical appearance of such an area is shown in Fig. 1.

The leaves of affected clover plants show variable but nevertheless recognisable symptoms. On the Mt. Barker strain (the common midseason strain grown in the lower South-West) the older leaves pale from the edges and turn a dull yellow. A fine spotting then develops on the leaf surface and these spots later join together to give dead areas which can often be mistaken for insect damage. Subsequently the edges of the leaves scorch and the whole leaf dies rapidly.

Where the deficiency is severe the plants are poorly grown and the leaves a dull yellow or putty colour so that they resemble the leaves of zinc-deficient clover plants. Where the deficiency is so acute, however, the areas soon reach a stage where the clover disappears from the sward completely and the remaining pasture consists of annual grasses of low value such as silver grass.

Typically in the paddock, leaves are seen exhibiting various stages of potassium deficiency. A poorly-grown patch in a potassium deficient clover stand will contain

Fig. 5.—Potassium deficiency symptoms developed in pot trial. Similar symptoms are frequently seen in the field

many dull yellow leaves; some leaves showing marginal scorching; and some completely withered.

Both the Yarloop and Dwalganup strains of subterranean clover appear to show more marked scorching of the edges of the leaves than is the case with the Mt. Barker strain. In the Mt. Barker strain the dull yellowing of the older leaves and fine surface spotting is a far more common symptom than the marginal scorching.

Chemical analysis of plant material can be used to confirm suggested potassium deficiency. If the dried leaves contain less than 0.8 per cent. potassium, maximum growth cannot be expected.

Deficiency is, of course, best confirmed by obtaining in the field improved growth with a fertiliser containing potassium.

WHERE POTASSIUM DEFICIENCY MAY OCCUR

Potassium deficiency may be expected to occur on any of the light-textured soils of the higher rainfall areas which are utilised in such a way that there is a drain on the potassium reserves of the soil.

It may develop on the sandy loams of the south-western areas which originally carried marri (redgum) and on the light loams of the southern areas which originally supported karri forrest.

On some of the very sandy soils along the west coast, south of Perth, and along the south coast, potassium deficiency may become obvious soon after seeding. This applies also to the peaty sands, of which many of the coastal swamps are constituted. These are also low in natural potassium reserves and exhibit deficiency even before any potassium has been removed.

The deficiency has occasionally developed on heavier soil types where removal of hay over a long period has seriously depleted the potassium reserves of the surface soil.

In all cases the practice of cutting and removing hay will hasten the onset of the deficiency. In many cases the deficiency appears to be more frequently related to farm practice than to soil type.

PRESENT RECOMMENDATIONS

The potassium supplies of sandy surfaced soils are usually found associated with the organic matter accumulated in the top few inches. Particularly where cultivation is practiced most of this potassium quickly becomes available to the pasture plants. However, following this initial release, leaching and removal of plant material reduce soil potassium to a very low level at which acute deficiency occurs and the clover disappears completely from the sward.

In those cases re-establishment can only be ensured by reseeding to clover, and by applying muriate of potash at a substantial rate—up to 200 lb. per acre. Excellent clover growth should be obtained, but if the area is cut for hay a dressing of potash should be applied in the following year. Until further information is available, it is suggested that, when hay is not cut, the superphosphate-potash mixture (5 parts of superphosphate to 1 part of muriate of potash) now available be used at the rate of 1 bag (186 lb.) per acre.

On areas where deficiency is less severe and clover persists but develops deficiency symptoms in the spring, a dressing of 1 cwt. per acre of muriate of potash should be sufficient to ensure satisfactory growth. Here again, the same dressing should be repeated should a hay crop be removed. Thereafter, under grazing conditions, the use of the superphosphate-potash mixture should be standard practice.

On the lighter-textured soils of the south-west where deficiency has not yet appeared, it is recommended that the superphosphate-potash mixture be used annually to prevent the development of deficiency. Admittedly under grazing conditions, practically all of the potassium taken up by animals is returned in the dung and urine. However, the application of small quantities of potash fertiliser annually to these lighter soils should ensure maximum growth and should so build up potassium supplies in the soil that hay crops can be taken once every few years without seriously depleting potassium reserves.

It must be realised that the maximum benefit from potash fertiliser can only be

obtained if the plant requirements for superphosphate, copper, zinc and sometimes molybdenum have been met.

When applying heavy dressing of muriate of potash there is a danger of severe injury to the young plants. To avoid this danger every attempt should be made to topdress with potash fertiliser during the dry months. If, however, it is essential that the area be topdressed after germination, mornings when there is dew on the plants or days when very light rain is falling should be avoided. It is the formation of a concentrated solution, due to the fertiliser being dissolved in a small amount of water, that causes injury which is evidenced by a scorched appearance of the leaves. Heavy rain or even a strong wind will remove the fertiliser from the leaves and so reduce the danger of injury.

FURTHER EXPERIMENTS

Additional experiments are in progress on soils where potassium deficiency has occurred, and has been overcome by manuring, to determine the quantities of muriate of potash which are needed in the years following the initial heavy dressings. It is hoped to ascertain the potassium requirements under varying conditions of management including—

(1) Grazing only.
(2) Grazing with hay cut and removed every year.
(3) Grazing with hay cut and removed every second year.
(4) Grazing with hay cut and removed every fourth year.

This information will enable more accurate recommendations to be made for manuring with potash fertiliser to ensure permanent productive pastures.

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PLANT DISEASES

BEAN, SUBTERRANEAN CLOVER AND LUPIN DISEASES CAUSED BY THE BEAN YELLOW MOSAIC VIRUS IN WESTERN AUSTRALIA

By H. L. HARVEY, B.Sc. (Agric.), Senior Plant Pathologist

FOR the past two seasons a survey of the diseases caused by the bean yellow mosaic virus in Western Australia has been carried out with a view to assessing their economic importance. This article is intended to give information on the symptoms and occurrence of these diseases on the more important hosts in Western Australia. Consideration has been given to control aspects, but in the present state of our knowledge, no reliable recommendations can be made.

Fig. 1.—Bean yellow mosaic (B.Y.M.) on Brown Beauty bean leaf. Note vein-clearing, mottle and irregular margins of leaflets.

Bean yellow mosaic has occurred naturally in Western Australia on French and runner beans for some years. Newly recorded hosts are subterranean clover, burr medic *(Medicago denticulata)*, West Australian blue lupin *(Lupinus varius)*, New Zealand blue lupin *(L. angustifolius)*, yellow lupin *(L. luteus)*, ornamental lupin *(L. mutabilis)* and broad bean. Others that have been infected artificially by inoculation are garden pea (Greenfeast), white lupin *(L. albus)*, crimson clover *(Trifolium incarnatum)*, Bokhara "clover" *(Melilotus alba)* and barrel medic *(Medicago tribuloides)*. Barrel medic does not appear to have been recorded elsewhere as a host of the virus.

Hosts, in addition to these, have been recorded elsewhere and include red clover *(T. pratense)*, yellow sweet clover *(Melilotus officianalis)*, cowpea, lima bean, pigeon pea, soybean and gladiolus.

Fig. 2.—Bacchus Marsh subterranean clover leaves infected with B.Y.M. The leaf at the left is healthy.

SYMPTOMS

French Bean.

When the disease first appears, the small veins in the leaf become conspicuous due to "clearing" or gradual loss of green colour. At the same time, the leaf surface tends to become rugose or roughened in contrast to the flat surface of the healthy leaves. Finally, a mosaic pattern of dark and light green to yellow develops on the leaves (Fig. 1) which are generally smaller in size than normal leaves and slightly irregular in shape. The diseased plants, especially if infected at an early stage of growth, may become stunted and yellow, and yield small and late-maturing crops.

Subterranean Clover.

Vein-clearing first appears and this gradually develops into a dark and light green mottle (Fig. 2). Leaflets are smaller in size and develop a puckered surface while leaf stalks are shorter than usual giving a dwarfed or rosetted appearance to the whole plant. A case of extreme dwarfing (Fig. 3) is seen in a plant of the Dwalganup variety several weeks after inoculation with the bean yellow mosaic virus.

West Australian Blue Lupin.

The first sign of the disease in West Australian lupins is the malformation of newly emerged leaves (Fig. 4). The leaf stalks bend down slightly and the leaflets instead of retaining their normal shape, become noticeably twisted. Growth subsequently, may cease or result in only very small leaves which assume the shape of a clawed hand. In the advanced stage of the disease, affected plants in the field can be noticed readily among healthy lupins by the bunched and often stunted habit of growth of one or more branches (Fig. 5) on which flowers and seeds may fail to develop. Very young plants may be killed by the virus.

New Zealand Blue Lupin.

The disease first makes its appearance as a slight drooping of the growing tip which soon bends over to one side (Fig. 6). The young leaves wilt and the growing tip finally dies. On some of the older leaves, the leaflets may wilt and hang vertically. They turn yellow and fall, leaving bare leaf stalks. The main stem assumes a dark colour due to death and blackening of internal stem tissues. As with West Australian lupins, plants infected in the early stages of growth may be killed rapidly (Fig. 7). If however, infection occurs in a plant nearing full development, the tip of the main stem wilts, bends over

and dies but the rest of the plant may remain normal. All stages between early and late infection may be seen in the field.

Burr Medic.

Symptoms are similar to those found on subterranean clover. The veins become markedly "cleared" but mottling is less pronounced.

Yellow Lupin.

Vein clearing is an early symptom on the young leaves. Plants which survive to near maturity may be badly rosetted with short narrow leaflets which fail to unfold normally. The flowers may be abortive (Fig. 8).

TRANSMISSION AND SEASONAL CARRY-OVER OF THE VIRUS

The only known method by which yellow mosaic may be transmitted in nature is by aphides which carry the virus-infected sap from diseased to healthy plants in the process of feeding. There is no evidence to suggest that the virus is carried by the seed or that it survives in the soil.

In the bean-growing areas, the last of the late-sown beans in some years are still standing in the market gardens when the first of the early beans are planted in adjacent gardens. In addition, West Australian lupins and burr medic (which grow as winter weeds in these areas), are often found infected with the virus. Under these circumstances, virus reservoirs are always present for aphids, which are active to a greater or lesser extent throughout the year.

There is no ready explanation however of the summer carry-over of the virus in the more remote grazing areas where no known hosts survive the summer months.

The infection of subterranean clover and lupins in the winter is therefore suspected of originating from certain species in the surrounding native flora which survives the summer months. The only suspect to date is a red flowered perennial leguminous creeper *(Kennedya prostrata)* which grows throughout the South-West corner of the State where subterranean clover, lupins and beans are grown. Leaf mottling, distortion and dwarfing of many of these plants has suggested virus infection but attempts to isolate a virus have so far been unsuccessful. Further work on this and other possible native hosts is proposed.

Fig. 3.—Left: Dwarfed plant of Dwalganup subterranean clover plant several weeks after inoculation with B.Y.M. Right: Healthy plant of the same age.

Fig. 4.—Left: West Australian blue lupin showing early symptoms of B.Y.M. infection. Right: Healthy plant of the same age.

Fig. 5.—West Australian blue lupin naturally infected with B.Y.M. showing advanced symptoms on the upper parts of the plant.

INCIDENCE OF THE DISEASE

The amount of spread is governed by the activity of infective aphides. In plague years, the incidence of yellow mosaic can be expected to be high and conversely when aphid activity is low, the spread of the disease is only slight. It is to be ex-

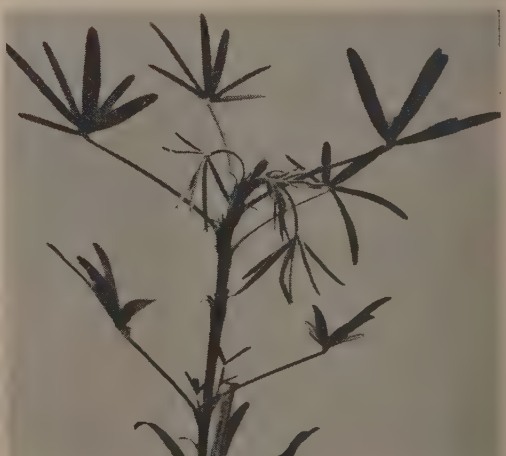

Fig. 6.—New Zealand blue lupin showing wilting of top growth, an early symptom of B.Y.M. infection.

pected then that considerable fluctuation in the seriousness of the disease will occur from year to year.

This phenomenon has been observed for a number of years with French and runner beans but for the remaining hosts which were recorded for the first time in 1954, observations have been made for two years only.

French Bean.

In most seasons, yellow mosaic ranks as important as any other bean disease in Western Australia. It is quite often found in association with common mosaic a similar but distinct virus disease and when both occur on the same bean plant, an overlapping of symptoms may result. Yellow mosaic appears to be worse in the early spring sown French beans than in the main summer crops of runner beans.

Fig. 7.—Right: New Zealand blue lupin killed at half-growth stage by natural B.Y.M. infection. Left: Healthy plant.

Fig. 8.—Left: Yellow lupin plant showing advanced symptoms of B.Y.M. infection. Right: Healthy plant of same age.

Subterranean Clover.

From observations in 1954 and 1955, the midseason variety, Mt. Barker, was the only one affected to any noticeable extent on grazing properties and then only on restricted areas. It was estimated that, on the average, infected plants grew to only 75 per cent. of the size of normal plants. No information has yet been obtained on the effects of the disease on seed setting or on seed viability.

Little or no mosaic was observed in the lower rainfall wheatbelt areas which are predominantly sown to Dwalganup subterranean clover. Glasshouse tests however have shown all varieties commonly grown in Western Aus-

tralia to be susceptible. The varieties tested were Dwalganup, Mt. Barker, Yarloop, Bacchus Marsh and Tallarook.

West Australian Blue Lupin.

In 1954, West Australian lupins examined in the area between Northampton and Perth were virtually free of the disease but within a 20 mile radius of Perth a fairly uniformly low percentage of infected plants were found. The disease was therefore not serious. The naturally shed seeds of this legume are valuable as sheep feed in summer and autumn and for re-seeding for the following season.

In 1955, the disease incidence was relatively high within a radius of 40 miles of Perth, and seed formation was significantly impaired in many cases. In one grazing area of lupins, 80 per cent. of the plants became infected early and were killed or stunted and many of the remainder were infected later. The loss in seed produced for grazing was more than 90 per cent. In a West Australian lupin crop grown at Gingin, for commercial seed production, a 50 per cent. loss of seed was estimated to have resulted from virus infection.

New Zealand Blue Lupin.

New Zealand lupin green-manure crops in many orchards and vineyards contained only a low percentage of infected plants. Moreover the infection occurred in most cases very late in the season just about flowering time when crops are usually ploughed in. The loss was therefore insignificant. It is possible however that in an early Spring, infection may occur at a young growth stage and reduce the bulk of a green-manure crop considerably. To date this has not been observed. It has been noted however, that where West Australian lupins and New Zealand lupins are growing together or in close proximity, the incidence of the disease is much higher and occurs earlier in the season in the former than in the latter species. The reason for this is not known but it may indicate greater palatability of West Australian lupins for the aphid vectors.

Burr Medic.

Although widely grown in this State, the disease has only been observed on a few individual plants in the vicinity of Perth.

Yellow Lupin.

This lupin is only grown to a limited extent and the incidence of the disease is very low.

THE PROBLEM OF CONTROL.

In view of the economic importance of these diseases in certain areas, the problem of control is receiving attention but it is not yet possible to recommend suitable measures. Three lines of approach which have possibilities and on which further investigation is required, are the prevention of virus transmission by aphides, the discovery of resistant varieties and the elimination of native and weed hosts in the vicinity of bean, subterranean clover and lupin areas.

DAHLIA VIRUS DISEASES

By H. L. HARVEY, B.Sc. (Agric.), Senior Plant Pathologist

OF the various disorders occurring in dahlias, a group of diseases caused by viruses can be responsible for considerable damage to this otherwise attractive garden plant. Two such diseases of importance in Western Australia are dahlia mosaic and spotted wilt. Rarely, if ever, do they destroy the plants. They may, however, cause dwarfing, leaf abnormalities and a reduction in the number and size of blooms.

In common with many other plant virus diseases, mosaic and spotted wilt are spread by the sap-sucking insects, aphids and thrips respectively.

A virus is an infectious principle that, once introduced into a plant, generally finds its way to all parts of that plant except the flower seeds. Initial freedom from virus is therefore ensured by propagating with seed but not with tubers or cuttings from infected parent plants.

Mosaic.

Causes a yellowish banding of the leaf veins (Fig. 1) which may be obvious in some cases or only just discernible in

others. There is a tendency for a shortening of the stems, with the development of side branches, and in bad cases, plants become dwarfed and bushy in appearance. Dahlia mosaic is not known to infect plants other than dahlias in Western Australia.

Spotted Wilt.

Causes leaf symptoms ranging from small faint yellowish spots (Fig. 2) to single or concentric rings and patterns of

Fig. 1.—Dahlia mosaic. Leaf showing yellow vein-banding.

Fig. 2.—Spotted wilt. Yellow spots on dahlia leaves.

Fig. 3.—Spotted wilt. Lines in the form of rings and other patterns on dahlia leaves.

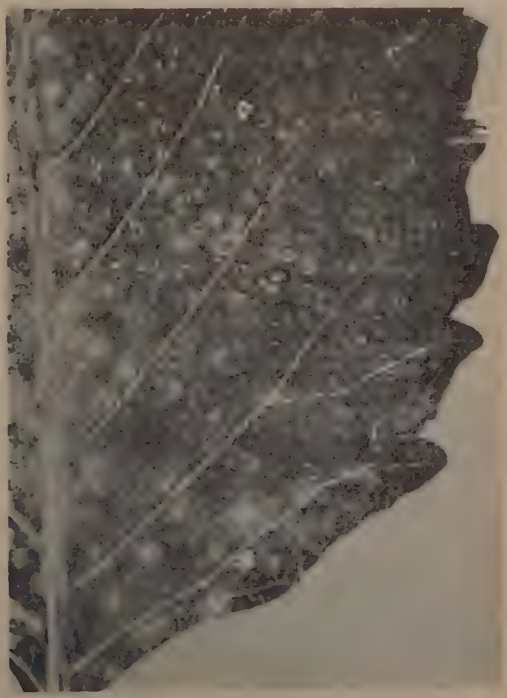

Fig. 4.—Spotted wilt. Numerous concentric rings have turned brown and given a rust-brown appearance to the leaf surface.

wavy lines (Figs 3 and 4). The rings and lines are at first yellow or pale green but may later turn brown due to the death of plant cells along the lines.

Spotted wilt hosts are numerous, including ornamentals, vegetables and certain weeds, but it is probably best known as a tomato disease of considerable economic importance.

CONTROL

Control measures for both diseases are based on:—

(1) Propagation by seed or by tubers and cuttings taken only from healthy parents.

(2) Control of the insect carriers by regular applications of insecticides containing DDT and parathion. Applications should begin when plants are small.

(3) Removal and destruction of plants which develop virus symptoms. Regular examinations should be made through the growing period.

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CITRUS CROP ESTIMATE

The following estimate of the citrus crops for the 1956-57 season has been released by the Superintendent of Horticulture, Mr. H. R. Powell. It has been prepared from information obtained from the main citrus growing districts. Fruit Growing Industry Trust Fund figures have been used as a basis of the estimate, with suitable adjustments to bring the figures to a twelve-month period.

Following on a most unusual year, commencing with heavy rains in February and a record wet winter and later spring, the blossoming of all citrus varieties was much lighter than usual and very variable in nature.

Navel oranges flowered fairly well, particularly in the coastal districts, but in northern areas it was patchy. Valencias, on the other hand, blossomed poorly in practically all areas and in northern areas was both very sparse and extremely late. This erratic blossoming and subsequent setting has made the forecasting of the coming orange crop very difficult.

Lemon blossoming was only fair, while mandarins and grapefruit was not profuse.

The setting followed very much the pattern of the blossoming. Navel oranges set fairly good crops, but Valencias were very light and in some orchards the crop is at an all-time low. Lemons set somewhat better than the previous year, but the crop will still be very much below normal. Lisbons are carrying better crops as a rule than Eurekas.

The summer growing conditions have not produced any abnormal shedding, and due to the lightness of the crops, fruit size is generally satisfactory.

At the present time, it appears that oranges in the coming season will show a very substantial decrease on the previous year, and this will be particularly marked in the case of Valencias. Lemons, which reached a very low level last year, should show a slight improvement, but the extent of this improvement will be largely influenced by the setting of the summer crops. Both grapefruit and mandarins are expected to be lighter than in 1955-56.

The following forecast of production is based on the assumption that normal weather conditions will be experienced between now and harvest.

	*PRODUCTION IN 1955-56 (bus.)	ESTIMATED PRODUCTION IN 1956-57 (bus.)
Oranges	405,000	300,000
Lemons	78,500	80,000
Grapefruit	23,500	19,000
Mandarins	9,400	8,000

* These figures are taken from data supplied from the Fruit Growing Industry Trust Fund, with suitable adjustments for outstanding deliveries.

INSECT Pests AND THEIR CONTROL

By C. F. H. JENKINS, M.A., Government Entomologist, and
D. G. SHEDLEY, B.Sc. (Agric.)

THE MEDITERRANEAN FRUIT FLY

THE Mediterranean fruit fly (Ceratitis capitata Wied) is without doubt the most serious insect pest with which West Australian orchardists have to contend. The creature has been known to science for nearly 140 years, and in that time has spread to almost every important fruitgrowing country in the world.

Experiments have shown that there is no more effective insecticide for use in fruit fly bait than sodium fluosilicate and that this bait when used correctly in conjunction with strict orchard hygiene can do much to reduce the ravages of this pest.

Regulations gazetted under the Plant Diseases Act make it compulsory to take action against fruit fly.

Fig. 1.—Adult female of Mediterranean fruit fly (greatly enlarged).

DISTRIBUTION

In this State the insect is known as far north as Carnarvon, where it was first found in 1934. The permanent home of the pest, however, may be regarded as that area of the State westward of a line running from Gingin south-eastwards to include Northam and York, and thence southwards to Balingup and Busselton. Casual outbreaks have occurred at Bridgetown, Albany, Mt. Barker, Kalgoorlie, Sandstone, and other outlying localities where it has failed to become established.

In the case of the southern fruitgrowing areas, failure is probably due to the stringent control measures adopted and relatively unfavourable climatic conditions, whereas in other districts the scarcity and lack of continuity of suitable host fruits accounts for its spasmodic appearances.

DESCRIPTION AND LIFE HISTORY

The Adults.

The Mediterranean fruit fly is a two-winged insect a little smaller than the house fly. The general colour is yellowish or light brown. The wings bear brownish bands and spots, and the abdomen has two light coloured rings. The pattern on the thorax or back consists of irregular white markings on a black background.

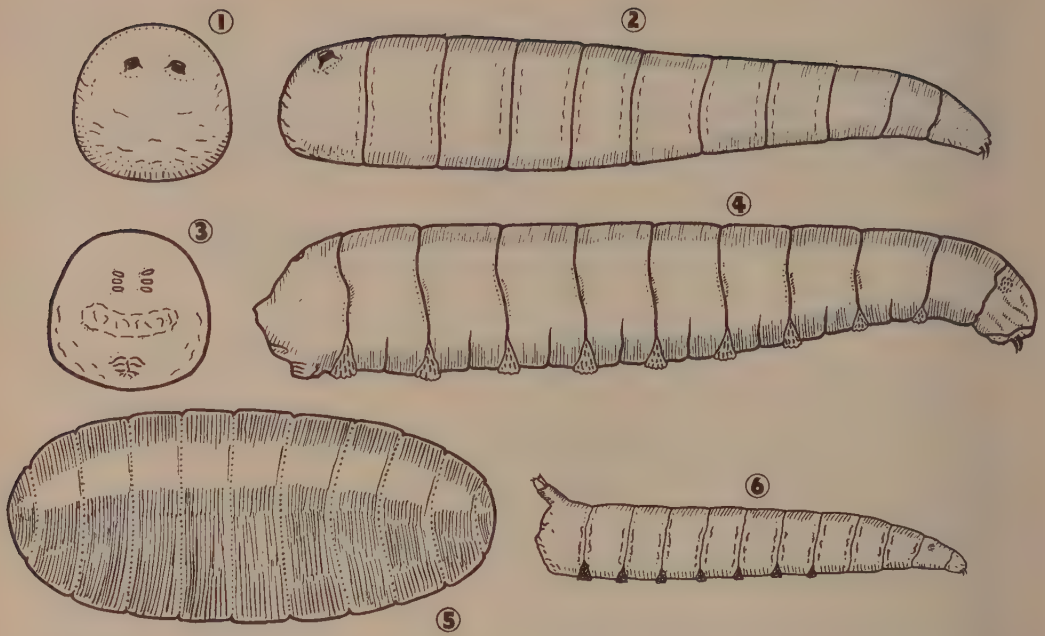

Fig. 2.—1 and 2, side and end views of larva of tomato fly (Lonchea splendida). 3 and 4 side and end views of larva of Mediterranean fruit fly (Ceratitis capitata); 5, Pupa of Mediterranean fruit fly (Drosophila sp.).

giving a mosaic appearance. In the sunlight this pattern often shows a metallic sheen. The wings are normally held in a drooping and what appears to be a semi-spread position, and are never folded flat on the back as in the case of the house fly.

Mating and egg-laying does not take place in the young flies until they are about a week old. During this period the flies can be most successfully attacked, for like house flies these insects are fond of sweet liquids. They are unable to live longer than about four days without food and consequently if baiting is regularly carried out by all growers it would be possible to poison off many flies before they reach the egg-laying stage.

The female fruit fly seldom strays far from the protecting foliage of fruit trees and when suitable hosts are available a puncture is made in the skin of the ripe or ripening fruit and six to eight eggs are deposited in the cavity made.

The Eggs.

The eggs, which measure approximately 1/25th inch in length and are a creamy white colour, hatch in summer in from two to four days. In winter, however, the time required may be as long as 20 days.

The Larvae.

The tiny maggots, upon hatching, immediately commence feeding and burrowing into the fruit. This activity causes the tissue to break down, soft spots to form and in some instances the complete decomposition of the fruit. The maggot when fully grown is about $\frac{1}{3}$ of an inch in length and creamy white in colour. In fact, it resembles very much in general appearance a house fly maggot or a undersized blowfly maggot.

The time spent in the fruit will vary according to the weather conditions and the type of fruit, but the period in summer is about 14 days and in winter sometimes as long as 45 days. One interesting feature about the fruit fly maggot is its ability to jump. When placed on a dry surface it can, by a sudden muscular action, skip to a distance of a foot or more, this is not however a characteristic of the fruit fly maggot alone for various fly larvae, including

"cheese jumpers" and the maggots of the tomato fly, possess this ability.

When fully developed, the maggot leaves the fruit, drops to the ground, if the fruit has not already fallen, and burrows into the soil.

The Pupae.

As soon as it burrows into the ground the maggot changes into a rounded barrel-shaped pupa looking not unlike a rather dark swollen grain of wheat. The pupal or resting stage varies from 12 to 50 days according to the time of year after which the fully developed fly emerges and forces its way up to the surface of the ground.

LIFE SPAN OF FRUIT FLY STAGES IN WESTERN AUSTRALIA

	Adult Fly	Egg	Larva	Pupa
Summer	28-112 days	2-4 days	14-16 days	12-14 days
Winter	17-112 days	10-20 days	25-45 days	25-50 days

Fig. 3.—An orange showing numerous fruit fly punctures in the skin.

FRUITS ATTACKED

Well over 100 fruits, nuts and vegetables have been recorded as hosts for the fly in different parts of the world. Many of these records have, however, been secured under artificial conditions and certain hosts are definitely more susceptible to attack than others.

In Western Australia the fly has been found attacking peaches, figs, apricots, pears, all citrus fruits, nectarines, apples, grapes, plums, persimmons, quinces, loquats, plantains, passion fruit, bananas, mulberries, olives, walnuts, tomatoes and the sapodilla. Such ornamentals as the guava, feijoa, pomegranate, clerodendron, lillypilly, chilli, rose, Irish strawberry, Barbados gooseberry, prickly pear, Osage orange and Natal plum, are also known hosts, and to complete the list must be added the following weeds: African box thorn, apple of Sodom, and black-berried nightshade.

An examination of this list will show that not a single native plant is included. The importance of this cannot be too fully emphasised, for it means that with the exception of relatively unimportant weeds, all the hosts of the fruit fly in Western Australia are cultivated plants. This simplifies, or should simplify, the problem of control very considerably. It means that if all growers were fully alive to their responsibilities the fruit fly menace could be, if not eradicated, so reduced as to be of little importance. In countries where native fruits harbour the pest the task is very different. There every care may be taken in the orchard only to be nullified by an invasion from bush or jungle, but in Western Australia a man can only blame either himself or his neighbour (of course it is usually the latter) for the presence of fruit fly in his orchard.

RELATIVE IMPORTANCE OF DIFFERENT HOST FRUITS

All host plants are, of course, not equally attractive to the fly or suitable for its development. In the passion fruit, for instance, fully-developed maggots have never been found in this State, although damage is caused by the disfiguring wart-like growths which arise on the skin following egg-laying. Maggots have been found working in pomegranates but no flies have been reared from such fruits. Although not normally regarded as a host when picked under commercial conditions, bananas have been found infested with fruit fly and adult flies have been bred from fruit infested in the field. Tomatoes, olives and walnuts were all found infested with fruit fly for the first time in Western Australia in 1955, and so far only a single record of each has been noted (Jenkins 1955). Development in lemons only occurs

in very ripe fruit and normally then only when the skin has been split or broken. Many plums and grapes are apparently too watery to form suitable homes for the maggots. Peaches, apricots, pears and figs, on the other hand, are notorious breeders of the fly.

Although citrus growers suffer comparatively little loss from fruit fly, citrus are amongst the most important hosts of the pest. The reason for this is that when the summer soft fruits are finished the fly is able to carry over the winter in the citrus orchards. Grape-fruits are amongst the most susceptible varieties to infestation, but it is an interesting fact that only a low percentage of the eggs laid in citrus develop successfully. It is believed that the oil in the rind seals the egg cavity, or in some way interferes with normal hatching.

The attractiveness of oranges to the fly is amply exemplified by the number of punctures which may be seen on fruits in any infested orchards. These punctures are readily observed, for a discolouration of the surrounding skin results, and such marks are popularly known as "stings."

Another host plant which must receive attention is the loquat. This fruit is very important because it serves as a link between the winter citrus and the early stone fruits, and the bigger build up of population there is in the loquats, the earlier will losses occur in apricots and other soft fruits.

POWERS OF REPRODUCTION

As an illustration of the great reproductive powers of this fruit pest, the following figure are illuminating. From one pair of flies laying on September 1, the possible progeny by the middle of January, a period of 4½ months, would amount to 6,750,000 flies. Such a calculation is based upon each female laying 300 eggs, 150 of which would produce female flies, and so on. Of course, this hypothetical reproduction never takes place in actual practice, but the potentialities are sufficient to make it clear to everyone that the pest is not one to be trifled with.

ECONOMIC IMPORTANCE

The financial loss to fruit growers in this State generally caused by the fruit fly each year is difficult to calculate; that

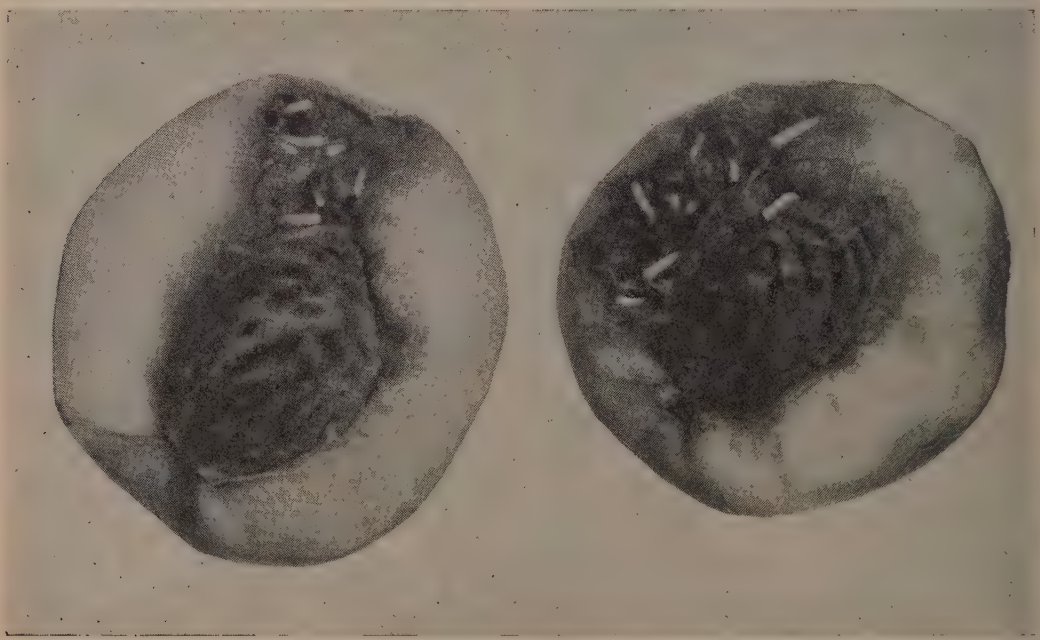

Fig. 4.—Peaches showing typical fruit fly damage.

it is considerable none will deny. In addition to the actual value of the fruit lost and the expense and labour of constantly fighting the pest, the indirect loss caused by the fact that the cultivation of certain profitable crops is prevented or limited must be borne in mind. When it is remembered that the average value of the fruit industry to Western Australia is several million pounds per annum, the necessity for doing everything possible to control the pest will be evident. Not only must it be checked in areas where it is now present, but its spread to clean districts must be prevented.

CONTROL MEASURES

The first thing to be realised is, that for really satisfactory results, concerted action is necessary, both in the application of bait sprays and in the regular and thorough removal and destruction of infested fruit. A few careless individuals in a district can do much to nullify the work of their neighbours and perhaps jeopardise their livelihood.

BAITING

For many years trapping by means of lures such as pollard and borax, "Clensel" and "Beeco" solutions in glass jars and tins was widely advocated, and when intensively carried out was quite effective. This method was later replaced by the use of foliage baits (Newman and Jenkins 1936) which, besides being efficient, have the advantage of being easily and rapidly applied, especially where large areas need treatment. Although various insecticides including DDT, BHC, Parathion, HETP ("Hexone"), dieldrin, aldrin and chlordane have been tested for fruit fly control, nothing has been found superior to sodium fluosilicate when mixed in a sugar solution and applied to the foliage. (Ryan 1950) (Shedley 1954).

Bait Formula Recommended.

Sodium fluosilicate—1 oz.
White sugar—2½ lb.
Water—4 gallons.

One gallon is sufficient for 40 normal sized trees or 100 vines.

For backyard gardens, a stock solution can be made using:—

Sodium fluosilicate—1 teaspoonful.
Water—1 pint.

For use, thoroughly shake the mixture and add six tablespoonfuls (3 ozs.) of the stock solution and 3 tablespoonfuls of sugar to one pint of water. This should be sufficient for five or six trees.

Proprietary Mixtures.

In addition to the home-made bait, there are certain proprietary mixtures available, viz. "Luratox," "Fluotox" and "Lurafly" which comply with Departmental recommendations.

How to Apply Bait.

In a large orchard or vineyard the use of some type of spray pump fitted with a coarse nozzle will usually be found the most convenient way of applying the spray. Where such expensive equipment is not warranted, however, the bait can be splashed on the foliage with a whitewash brush or applied through a container with a perforated lid such as a shaker topped bottle.

When to Apply Bait.

The maximum period between treatments should be six days, but, of course, if heavy rain washes the bait off before this time has elapsed, a second treatment should be given. As the fruit fly frequently attacks fruit before it is ripe baiting should be commenced at least six weeks before the crop is ready to pick and continued right through the season until a couple of weeks after the trees have been stripped, just to make sure that any straggling flies are not allowed to escape.

Warning.

In mixing and applying any of the formulae the quantities stated should be rigidly adhered to, thus reducing the chance of any possible injury to the foliage or harmful deposits of poison on the fruit. Some people apply a complete cover spray to their trees when baiting in the belief that they are fulfilling requirements. The object should be to have a quantity of sticky bait here an there on two or more sides of the tree, avoiding the fruit as much as possible. Wandering flies will then have a good opportunity of feeding.

Fig. 5.—Foliage bait spraying and picking up fallen fruit.

ORCHARD SANITATION AND DISPOSAL OF INFESTED FRUIT

Although foliage baiting is an important factor in fruit fly control, it can only hope to be really effective when carried out in conjunction with strict orchard sanitation. As the fruit becomes mature, it should be picked. Fruit left on the tree is a potential breeding ground for the pest which will develop rapidly in the ripe material. Infested fruit should never be allowed to lie on the ground, and should be disposed of by boiling, burning or soaking in water and kerosene. Burying is not recommended and when the life history of the pest is recalled the reason will be clear. The maggot naturally burrows into the soil to pupate, so that by burying maggoty fruit the flies' normal development is only being assisted. Certainly, if the fruit is buried deeply enough no insects can emerge, but when it is remembered that fruit flies have successfully pushed their way through four feet of dry sand the weakness of this method is obvious. It has been found that infested fruit placed in a pit and liberally treated with BHC dust before filling in will prevent fruit fly development (Ryan 1950). This technique may be of value where disposal of large quantities of infested fruit is necessary and where other means of disposal would be too difficult.

In order to simplify the work of sanitation, growers, and this especially applies to backyard growers, are advised not to let their trees attain such proportions that the fruit cannot be easily reached. Special attention should be paid to fig trees and loquats, for often these are neglected and allowed to carry far more fruit than can possibly be used. Such trees should be cut back to a height of say 10 feet so that they can be baited easily and so that the fruit can be conveniently picked. When allowed to grow unchecked they become a menace to neighbours and perhaps to the owner when the Fruit Fly Inspector calls.

Where individual trees are found to be heavily infested, besides baiting the foliage and destroying the fruit, the surface of the ground under the tree may be dusted with BHC which should then be worked into the surface layer of the soil. For this purpose 100 lb. of 10 per cent. BHC per acre or 1 oz. per 3 square yards, (1¼ lb. of lindane per acre), is recommended. This will help greatly in preventing flies from emerging from pupae already in the ground.

Fig. 6.—Infested fruit being tipped into a drum of water and kerosene.

Every grower should aim at getting good clean fruit from his trees, and if this cannot be realised he will be doing a public service by removing them.

LEGISLATION

To aid in the control of fruit fly, it has been found necessary to introduce certain regulations including the compulsory baiting in certain areas and the restriction of movement of fruit within the State.

Registration.

All fruit trees must be registered annually with the Department of Agriculture and a registration fee paid. The details supplied enable Inspectors to check on the most susceptible types of fruit at various seasons of the year and to advise on control measures where these are not being carried out efficiently.

Compulsory Baiting.

Where fruit fly occurs it is compulsory to carry out control measures including the application of the bait recommended in this article and the regular gathering of fallen fruit.

In districts where more than 60 per cent. of the growers voting in a poll agree, the baiting may be carried out on a community basis.

Movement of Fruit.

The main fruit growing districts of the State have been divided into three areas. District 1, which includes the Metropolitan Area, the coastal plain as far south as Cookernup and the associated hills districts, is considered to be regularly infested and fruit movement from this area is restricted. District No. 3 which embraces that part of the State south of Katanning and Kirup is considered normally to be free of fruit fly and movement of fruit into this area is restricted. Area No. 2, which is the zone between areas 1 and 3, has certain restrictions limiting both the inward and outward movement of fruit.

Further details concerning these Regulations can be obtained by referring to the relevant portions of the Plant Diseases Act, copies of which are available on application from the Department of Agriculture.

SUMMARY OF CONTROL MEASURES

(1) Prune trees to a manageable size.

(2) Bait regularly using a sodium fluosilicate foliage bait.

(3) Pick fruit as it ripens.

(4) Destroy properly all infested fruit.

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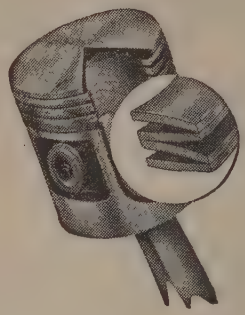

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FIREBREAKS AND SOIL EROSION

By L. C. LIGHTFOOT, B.Sc. (Agric.), Assistant Commissioner of Soil Conservation

EROSION has turned many firebreaks into gullies and farmers have sought support of the Soil Conservation Service against local governing authority orders to make firebreaks. But the interests of farmers demand good firebreaks. Ground cover is undoubtedly improving and hence fire prevention is becoming more important every year.

Farmers can take several steps towards preventing erosion on firebreaks and local authorities can often assist. Firebreaks are needed and erosion on firebreaks can be prevented.

(1) Ploughed firebreaks on slopes can stop erosion by water action if loops are ploughed every few chains. See, "Stop Firebreak Erosion," Bulletin No. 2291, Department of Agriculture of Western Australia, or Journal of Agriculture, September-October, 1955.

(2) Tillage should leave a rough cloddy surface on firebreaks. Both implement and speed can be adjusted to give a cloddy surface if the soil is moist and has the ability to form clods. High speed tillage usually leaves soil too fine. A cloddy surface helps to prevent erosion.

(3) Sands, and some other soils, won't give a cloddy surface. Ploughing to part bury and anchor grass and stubble in the soil, but leaving some above the surface, is an effective way of stopping erosion by wind. A cover much too thin to burn will stop wind erosion.

(4) Don't cultivate the same strip every year. Alter position of firebreak so that each strip is tilled only once in three to five years; this helps to preserve favourable soil structure and prevent erosion.

(5) Farm roads properly formed, drained and maintained, make good permanent firebreaks, as well as stopping erosion of roads and giving better access to various parts of the farm. See "Roads Erode" Bulletin 2133, Department of Agriculture of Western Australia, or Journal of Agriculture, March-April, 1954.

(6) A new method of farm planning for soil conservation has been devised. This calls for fencing along natural obstacles to cultivation and fencing out areas requiring different grazing management. As adopted, this method will permit better location of firebreaks.

(7) On paddocks not usually top-dressed, superphosphate applied in strips one or two chains wide along firebreak lines may bring about concentration of grazing and leave too little grass to carry a fire. Doubling super on strips on top-dressed paddocks may give the same result. Old heavy land, and pastures liberally top-dressed every year for several years, would probably fail to give results. There is not enough evidence to recommend this practice but it is probably worth trial as additional support for firebreaks.

(8) Late seeding strips of oats where firebreaks are required and grazing when green and other feed dry, has given good results in some cases and is probably worth trial. Cultivation should be kept to the minimum needed for a reasonable seedbed.

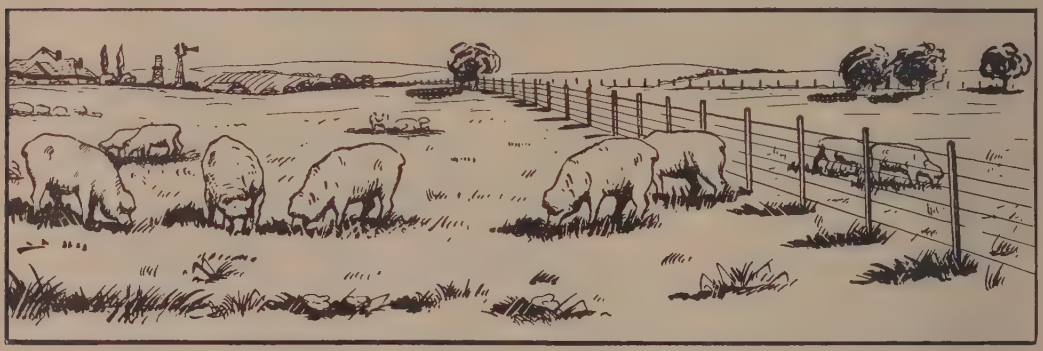
(9) In some cases firebreaks can be taken round areas of severe erosion hazard instead of through them, considerably lowering erosion risk. Where such changes do not comply with local authority orders, farmers should ask local authority approval for the desired alterations. With

over 1,000 bushfire control officers and some 2,500 captains and lieutenants of bushfire brigades, such requests should not prove too burdensome for local authorities.

(10) Local authorities may feel it worthwhile to use the wording of the Act in their firebreak orders, "to plough, cultivate, scarify, burn or otherwise clear firebreaks" not just "plough," so permitting breaks to be made as the farmer deems best in each situation.

(11) As local authorities are served by so many voluntary fire officers, they may feel they could give publicity to the possibility of agreed variations in firebreak orders, where erosion hazards can be lessened, and effectiveness of firebreaks retained.

Fire greatly increases erosion hazard and all feasible preventive measures must be taken. Erosion on firebreaks can be prevented or at least the risk can be reduced very much.



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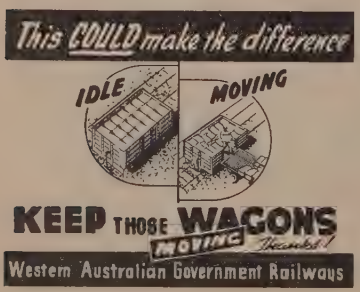

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WESTERN AUSTRALIAN GOVERNMENT RAILWAYS

Fig. 1.—Mr. H. Suijdendorp addressing visitors at the Munda wool-shed

PASTORAL RESEARCH

"Munda" Field Day Demonstrates Real Progress in the Port Hedland Area

By W. M. NUNN, B.Sc. (Agric.), Officer-in-Charge, North-West Branch

WHEN a programme of research was first put in hand at Abydos Research Station in 1951, it was generally thought that an almost impossible task was being undertaken—that of demonstrating that sheep might still be carried profitably on country which had been abandoned after years of occupation as commercial sheep stations.

Some half-dozen stations, comprising about 3,000,000 acres, had been abandoned in the early nineteen forties after flocks of 15,000 and 20,000 sheep had dwindled to mobs of a few thousand or less. Why had the carrying capacity decreased so alarmingly, and could the trend be reversed to enable the country to be occupied once again?

These were the questions as they were asked in 1946 when the then Premier (Mr. F. J. S. Wise) directed that the Abydos and Woodstock leases be vested in the Department of Agriculture for development as a Pastoral Research Centre.

The task was rather a frightening one, especially as at that time the Department of Agriculture had no staff trained for pastoral area investigations, and no advisory personnel in the lease-hold regions.

It is not to be wondered that subsequent governments baulked a little at embarking on a research programme, and turned hopefully to the Commonwealth Scientific and Industrial Research Organisation for consultation. C.S.I.R.O. declined even more firmly. Here was a field where lengthy and costly research could go on for years and still produce nothing. Agricultural graduates were hard to obtain for positions much easier to fill than that of research worker at such an isolated post as Abydos.

And so, for a few more years, the region remained neglected, and the leases were simply maintained in working condition against the time when research might become a practical possibility.

In 1950, impetus was given to the Department of Agriculture's interest in northern

Fig. 2.—Claypan furrowed only a few months prior to the field day. Grasses germinated with rains in late February and were only six weeks old when the photograph was taken

areas, by the formation of a North-West Branch, grouping the Gascoyne, Kimberley and Abydos Research Stations and making provision for the appointment of Agricultural Advisers to work from each of these three centres. One of them, Mr. Hank Suijdendorp, was prepared to accept the hardship of residence in spinifex isolation.

The next bewildering problem was—"How do we start, and whatever do we do first in this great sea of prickly and uninviting spinifex, which sheep were said to eat though we couldn't imagine why?"

Fig. 3.—The dual furrow as it looks when first formed on bare claypan surface

The initial trials were, naturally, ill-designed in the absence of any basic information concerning the forages that had provided the earlier carrying capacity, but Mr. Suijdendorp turned out to be an astute observer and a hard worker, and he soon made adjustments necessary to direct trials toward the main objective.

Really remarkable results were obtained during 1952 and 1953. So much so that a field day was arranged for April 3, 1954, when pastoralists were shown trial areas of country carrying an attractive stand of perennial grasses where spinifex alone had been in evidence for years. By simply managing his grazing on a deferred rotational system Mr. Suijdendorp had converted a pure stand of spinifex into a mixed stand of grass and spinifex, and had carried a sheep to three acres throughout the year while doing so.

These results have been written up in earlier issues of "The Journal of Agriculture," and are available in leaflet form for distribution to interested readers—see particularly:—"Station Management—The Value of Deferred Grazing," Leaflet 2194, by W. M. Nunn and H. Suijdendorp, and "Changes in Pastoral Vegetation can provide a Guide to Management," Leaflet 2302, by H. Suijdendorp.

This does not mean that Abydos goes straight back into operation as a wool-

Fig. 4.—The whole area shown here was a continuous bare claypan surface four years ago. The original furrow may still be seen in the centre foreground

producing station. We have dealt with only one of the soil types which go to make up the area. The next, now under attack, consists of country rather less fertile, where grasses do not flourish and where the edible types of spinifex have been replaced by a complete stand of quite unpalatable and useless woolly spinifex *(Triodia lanigera)*. This type may be very much slower to respond, but since one of the best of the palatable spinifexes *(Plectrachne schinzii)* is represented, the objective is to try to induce it to spread at the expense of its less useful relative.

In the meantime, work of this nature is not confined to Abydos. The Port Hedland group of the Pastoralists' Association is too lively a body to allow that to happen in their district. They have turned up in force to two field days at Abydos—the first in April 1954, the second in April 1955, and on Saturday, April 14, 1956, the third Pastoral Field Day was held, this time at Mundabullangana Station.

This station is owned by the Mundabullangana Pastoral Co., and managed by Mr. R. Lukis, who is also President of the local branch of the Pastoralists' Association.

A truly remarkable degree of co-operation has existed between Mr. Lukis and Mr. Suijdendorp, since the latter commenced his studies in the Port Hedland area. "Munda." is one of the out-standingly successful stations of the area, and its facilities and manpower have virtually been placed at Mr. Suijdendorp's disposal for research purposes, with the result that trials on the different types of country here available have been carried out just as if it were a Government research station.

The field day on April 14, was a triumph in local organisation as well as an outstanding success in its value as an extension function. Pastoralists travelled from stations up to 450 miles distant to be present, and there were very few stations within a 200 mile radius which were not represented.

The Munda. shearing quarters provided better accommodation than has been available in earlier years at Abydos, and the Richardson Bros. did their usual excellent job of volunteer catering.

Although Munda. is an excellently-run station in a favoured coastal location, this has not spared it from the ills of overgrazing in the earlier years of continuous stocking at high levels, which seems to have characterised all pastoral regions.

Fig. 5.—Claypan almost reclaimed. This was photographed three seasons after the orginal furrowing

The same excessive stocking practice, which at Abydos resulted in the replacement of grasses by spinifex on Type 1, and of palatable soft spinifex by inedible woolly spinifex on Type 2, has, on Munda., brought about the formation of thousands of acres of bare claypan where high production grasslands were originally established. On another type, the continuous stocking procedure of earlier days has resulted in the invasion of grasslands by poverty bush *(Acacia translucens)* to such a degree that the more seriously affected regions had become virtually useless for grazing purposes, while areas totalling probably 150,000 acres were affected to various lesser degrees.

RECOVERY OF CLAYPAN AREAS

Work on these areas commenced in 1951, and visitors were able to inspect sections which had been furrowed at different times since that year with a variety of agricultural implements. Most success had been obtained using a 3-furrow mouldboard plough with the middle share removed. This left two parallel deep furrows, with soil thrown up in a cloddy condition. The rougher the obstruction left in this way the better, as the objective is to check the velocity of ground level winds and bring about the collection of seed, soil and debris in those furrows.

Areas treated this way in 1952, with half-chain spacings between furrows, had been virtually covered over with a complete sward of grasses.

Perhaps the most telling part of the demonstration, so far as visitors were concerned, was the drive through thousands of acres of recently-furrowed claypan. This is no longer a trial treatment of uncertain outcome to Mr. Lukis. It is a routine station practice, and his plant is busy applying the treatment on a paddock-wide basis wherever these bare areas exist.

Deferred grazing is, of course, an essential part of the recovery programme. The furrows catch the seed and windborne soil particles. Deferment ensures that the plants produce and mature their seed for the densening of the cover in later years.

RECOVERY OF POVERTY BUSH AREAS

Only a few seasons back, when the first light seemed to be coming from the Abydos trials, where spinifex was disposed of by burning and grazing was deferred to promote grasses, the author inspected these poverty bush areas with Mr. Lukis and Mr. Suijdendorp. We felt that as an invader the bush should be capable of elimination, and if this could be arranged, then simple deferment should bring back the grasses. But poverty bush consists of a relatively loose tangle of sticks with an evergreen

Fig. 6.—The area on the right is overgrown with poverty bush. On the left and in the foreground perennial grasses have returned after burning and deferred grazing

layer of foliage two or three feet above ground. The sheep can get in and keep down the few grasses that survive under this degree of competition. It is almost impossible then to muster them, and the bush won't carry a fire.

This seemed to be a stalemate at the time, because there could certainly be no means other than by fire of economically removing a hundred thousand acres of poverty bush.

However, the answer was there to be seen on April 14, by the 54 interested visitors. Sheep had been removed from the paddocks in question for the growing period during two consecutive summers, to obtain a build up of inflammable material in the form of grass and spinifex below

Fig. 7.—Rotary slasher at work in dense poverty bush

the poverty bush. A rotary slasher was used to cut down lines a few chains apart to provide starting points for fires (Mr. Lukis now thinks a light scrub roller would be better), and at the appropriate time that poverty bush went up in a blaze.

Another deferment during the growing season following the fire, and those thousands of acres presented a picture of perennial grasses with only some black sticks to show that the poverty bush had once held sway.

In all, Mr. Lukis burned 40,000 of his 150,000 acres of poverty bush last summer. Jeeps dragging burning motor tyres over the accumulated material in hot summer overcame the final reluctance of the poverty bush to carry a fire.

Of course the poverty bush would return again if earlier continuous grazing methods were resumed, but the position is much clearer now, thanks to Mr. Suijdendorp's studies, and Munda. will make sure that grasses are given their opportunity to mature and drop seed. This is all the help they need to enable them to beat the slow growing poverty bush.

Illustrating the value of this work to Munda., Mr. Lukis stated that the 40,000 acres treated this year might have carried a sheep to 15 to 20 acres, but was rapidly going further downhill. Since recovery he now rates it as a sheep to five acres.

Once again it has been demonstrated that research carried out on a practical basis pays high dividends. There is call for more and more of this class of investigation throughout the pastoral regions.

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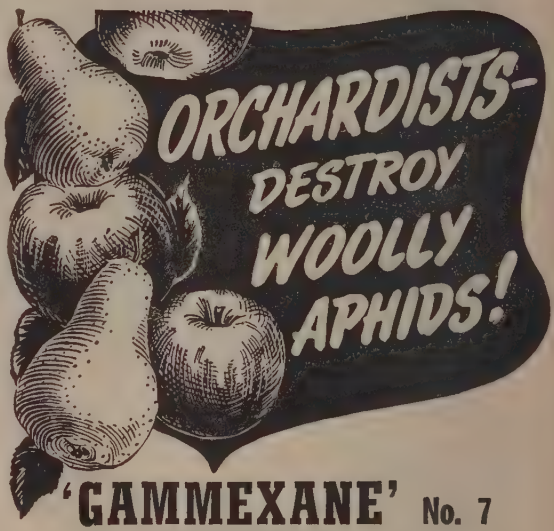

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WHALING RELIC AS WATER-TROUGH

This massive cast-iron cauldron which now serves as a water-trough for pedigreed Hereford cattle was once a try-pot used for boiling down blubber in the early whaling days of Western Australia.

It is on the property of J. and C. Barbetti, Waterloo, and appears to have been on the property for 50 years or more. As far as can be ascertained, it was brought from Bunbury by a previous owner of the property. Despite its great age, it still appears to be in excellent condition.

WATER SAMPLES FOR ANALYSIS

Samples of water for stock, irrigation and domestic purposes, are analysed by the **Government Chemical Laboratories, Adelaide Terrace, Perth,** on compliance with the following:—

A. Each sample should—

(a) Be approximately one pint of water in a clean container which has been previously rinsed with the water to be tested.

(b) Be clearly marked with the sender's name, address and date of sampling.

(c) Be securely packed and addressed to the **Government Chemical Laboratories.**

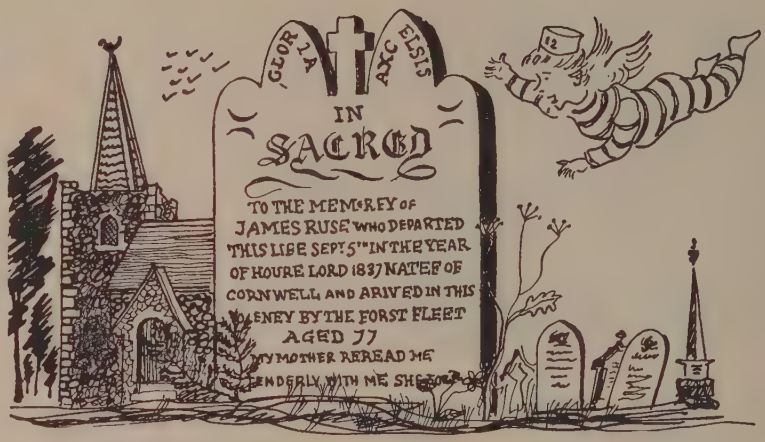
B. At the same time, a letter should be forwarded stating:—

(a) That the applicant is a bona fide farmer, market gardener, grazier, etc., and that the analysis is required in connection with his business as such.

(b) The source of the sample, e.g., bore, well, spring, etc., and its depth, and the location number of the property from which the sample was obtained.

(c) Enclosing the fee of 7s. per sample. This fee applies only to those who qualify under paragraph B (a) otherwise the fee is £1 1s. per sample.

Should the analysis be required very urgently, this should be stated in the letter and the cost of a telegram added to the fee, when a telegram will be sent immediately the analysis is completed.



A convict was Australia's first farmer

James Ruse was a convict. He could not spell, but wrote his epitaph and carved his own tombstone.

He is remembered in Australian history because he was our first farmer. He sowed our first wheat. Born in Cornwall, England, in 1760, James Ruse arrived in New South Wales in 1788.

The following year he was selected to carry out an experiment which had far-reaching results.

Ruse was given property at Rose Hill, near Sydney, to find out how long it would take a man to support himself.

He cleared the allotment, planted 1½ acres of wheat, half an acre of maize, and some vegetables. Two years later he was self-supporting. Subsequently, 44 convicts, 31 marines, 9 seamen, and a superintendent were granted about 4,000 acres of land, and Australia's farming industry was born.

When James Ruse died in 1837, he was buried at Campbelltown cemetery. His epitaph claims

"My Mother reread me Tenderly
With Me She Tock Much Paines
And When I Arrivd in This Coelney
I sowd the Forst Grain and Now
With My Hevenly Father I Hope
For Ever to Remain."

James Ruse and his fellow-farmers of the 1790's would be astonished to see the service Shell are providing to farmers today.

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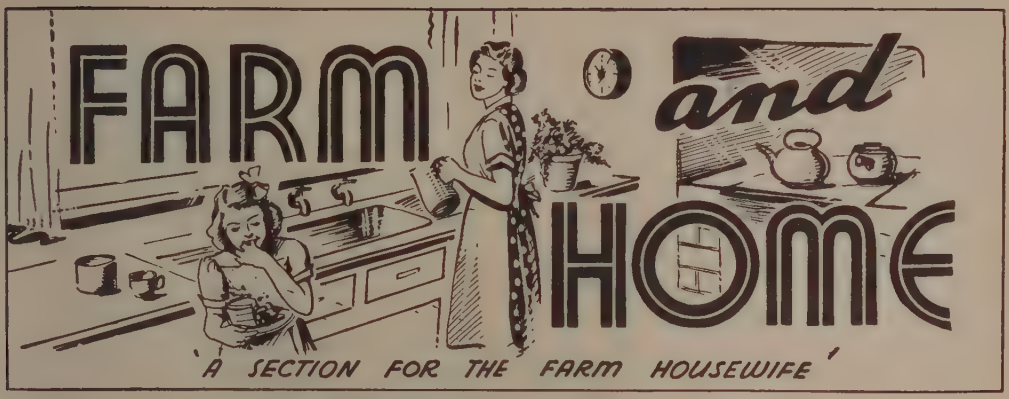
These products include weed-killers, insecticides, soil fumigants, hormone sprays, lubricants, and oil based solvents used in making drugs to fight stock diseases.

SHELL is the farmer's friend !



WASHING WOOLLENS

BY BRENDA CLEEVE.

KNITTING needles will be clicking again shortly as numerous garments are laboriously constructed revealing intricate patterns and styles. Even the plainest of woollens takes some time to make and all are expensive. All this painstaking work can be undone in a few minutes of careless handling during laundering. Once the damage has been done it is permanent and nothing can be done to return the garments to their former beauty.

The nature of the woollen fibre itself explains why every care should be taken in laundering. It is a wavy fibre, covered with minute overlapping scales which give a saw-like appearance under the microscope. When the fibres are treated roughly these scales are rubbed together and lock, giving a felted, shrunken surface. Once the fibres have felted they will remain that way for the lifetime of the garment. Rubbing and twisting of the garment while wet and sudden changes or extremes of temperature in washing waters are the factors which induce this felting more readily and are to be avoided at all costs.

WASHING

Woollen fabrics collect quite a lot of loose dust which can be removed by vigorous shaking.

If possible choose a windy, mild day for washing woollens so that they can be dried quickly. White woollens hung in intense sunlight will yellow and of course other colours will fade.

When washing a number of woollens wash those in the palest shades first as the dyes are loose in some colours especially reds, navy blues and greens. Try to wash each garment as quickly as possible.

The water for washing should be just warm—some people prefer cold water, but if the garments are very soiled, the dirt is removed more easily in warm water. As a rule more than one washing water is necessary so prepare at least two before you start.

To clean the garments use a mild soap or soap flakes. These should be thoroughly dissolved in the water before commencing to wash. Avoid using strong soap powders as some contain soda which affects the colours. Detergents can be used with good results. Follow the directions with the respective detergent with regard to the amount to use.

A cleaning agent which has been used on woollens and found to be most effective can be made as follows:—

Take 1 packet of soap flakes (such as Lux).

1 bottle of eucalyptus.

1 cup of methylated spirits.

Mix these three together and store in a jar. The ingredients will not mix to a paste completely. It can be stored indefinitely. Any odour from the eucalyptus is removed during the rinsing and drying processes.

Use just sufficient of the chosen soap to make a good lather, but not an intense one.

Wash woollens on both the right and wrong sides being careful not to stretch the threads while changing from side to side. Avoid rubbing or wringing. Instead use a kneading and squeezing action so that the soapy lather is forced through the fabrics. Avoid lifting the garment out of the water unless it is supported by your hands, as the weight of the water will stretch it.

Any very dirty spots can be treated by patting some of the lather through the patch. Resist the temptation to rub with a bar of soap on these spots.

Woollens can be washed by machine as the action with these is not a rubbing one. Follow the same principles regarding water and soaps. Wash woollens for two minutes only by machine.

When the garment is clean rinse in at least two waters of the same temperature as the washing waters, using the same gentle, squeezing motion. Rinse until all the soap is completely removed or until the last rinsing water is quite clear. For white woollens add one to two tablespoons of ammonia to the last rinsing water.

Remove as much moisture as possible before hanging on the line in order to preserve the shape. Pass the woollen through a wringer with a light pressure applied. Shake well afterwards to raise the fibres. A very satisfactory way to remove moisture is to roll the woollen in a bath towel for 10 to 15 minutes. It is surprising how much moisture the towel will absorb and the woollen can be hung to dry with no fear of its losing shape. Avoid hanging on the line when full of moisture as the weight of the water stretches a garment out of shape very quickly.

Before putting the garment to dry, shake it well, pull into shape gently, make sure all buttons are fastened and see that it is on the wrong side.

DRYING

If possible dry in a shady spot with a current of warm dry air. If put to dry carefully a woollen garment should require very little pressing.

The quickest way to dry most woollens is on the line with an old stocking passed through the sleeves and the stocking pegged at each wrist and the neck. For long-sleeved garments use two stockings knotted together. Pull the garment into shape without stretching. This method needs quite a lot of line space if a number of woollens are being dried.

A second method is to place the garment on a coat hanger which can be tied on to the line.

Lacy garments which stretch, are best laid on a towel which should be placed where the air can circulate through the garment. This can be arranged by placing the towel on the back of an inverted kitchen chair, on a cane chair or a piece of wire netting supported by bricks or attached to a framework. The top of a hedge is often a good place as the air can come up through the foliage. Tissue paper can be placed inside lacy woollens to separate the two layers of fabric and speed up the drying. If none of these supports is available the woollen may be put to dry on the lawn on a towel. Light, lacy garments can be dried by tacking them on to an old bath towel and pegging it onto the line. This is a quick method on a windy day. The garment can be tacked on with large stitches around the edge and a few across the centre. Avoid using pegs on woollens as they leave marks which need heavy pressing to remove them.

PRESSING

When woollens have been dried carefully, very little pressing should be necessary. They should be pressed on the wrong side when very slightly damp. If completely dry a slightly damp cloth should be used. The iron must be cool. Use a "press and lift" movement to avoid matting of the wool. Press lacy patterns very lightly on the wrong side, if at all.

ANGORA

To raise the nap on angora after washing, rinse finally in a solution of starch in cold water. Use two tablespoons of starch to a pint of cold water. Allow the garment to dry completely then shake to remove the dry starch. As the starch powder falls out it raises the fluff on the angora.

Woollens need careful handling at all stages of their life but any extra time spent in their care is well worth the effort.

SOME HINTS ON HEMLINES

BY BRENDA CLEEVE.

THAT well-dressed and well-groomed appearance which every woman longs to achiev is only possible when each item of one's outfit blends in that unobtrusive perfectio which comes from attention to details. How often, for instance, have you seen attrac tive and highly becoming frocks marred by lumpy, uneven hems fastened with stitche that are so obvious that they almost appear to be part of the trimming?

Far too frequently it seems as if the dress has just been finished in time to be worn on this particular occasion and the wearer has not had time to press the hem. That means that the time and trouble of planning and making a new dress have been largely wasted, for want of a little extra care in the final stages. Neat hems are important and in this article I have tried to indicate how good results can be achieved by the home dressmaker.

LEVELLING THE HEM

After the skirt has been attached to the bodice, and the placket opening neatened, the skirt should be levelled by measuring the distance of the hem from the floor.

The best way is for the wearer to stand on a table so that the hem is somewhere near the eye-level of the person doing the measuring.

A copper-stick or suitable piece of wood can be used, with the desired level marked by an elastic band or a pencil mark.

A simple measuring gadget can easily be made by inserting a length of broom-stick, dowelling or square wooden rod into a wooden base-plate.

A portion of a tape-measure is glued to the upright rod in such a manner that it indicates the height from floor level. For instance, if the base-plate is 1in. thick, cut off the tape-measure at the 1in. mark and place this end at the bottom of the upright where it enters the base-plate.

Place an elastic band round the upright as a height indicator. It can be moved up or down to give a suitable skirt length and is much more satisfactory than a pencil mark. (See Fig. 1).

Having marked the hem level (the best way is with a row of pins inserted in the skirt), open out all the seams and press them flat to avoid a lumpy hem, then turn up the hem along the row of pins an tack along the folded edge. It is wel worth while to do this line of tacking t make sure of an even hemline. Pins fa out and might not be replaced accuratel

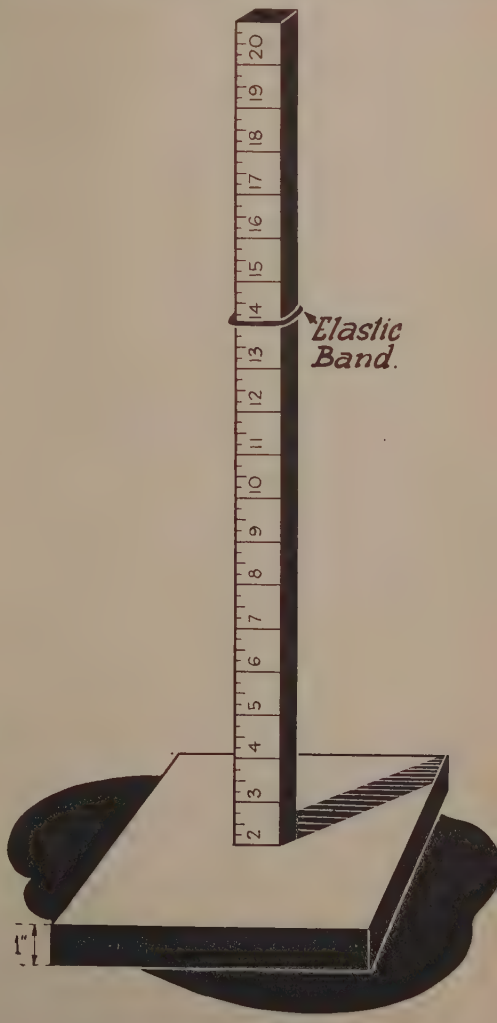


Fig. 1.—A simple hem-levelling gadget

REMOVING BULK FROM A HEM

Bulky hems can ruin the appearance of a dress so great care should be taken to dispose of any fullness at this point.

If the hem is a wide one, say of 1½in. or more, it should be carefully pressed to eliminate any fullness, especially in gored or flared skirts.

First pin up the hem at the seams, and on any parts where a straight grain occurs in the material, so that the fullness comes between these points.

On most materials, the fullness can be disposed of by a series of small pleats. Large pleats tend to give the hem a pointed edge and create an ugly line. Don't try to pleat the hem after it has been turned under, as this results in unnecessary bulk on the fold.

In woollen materials this extra fullness may be removed by shrinking. Pin the hem around, spreading the fullness as evenly as possible, using plenty of pins and then press lightly with a damp cloth. If there is much fullness a line of gathering may be put around the hem allowance about 2in. from the edge and the thread tightened until the hem will sit flat. Be careful not to pull the thread too tightly and pucker the hem. The fullness can then be pressed out as before. This method is often more satisfactory with woollens than the first method. Leave the gathering thread in position until the hem is finished.

When pinning a hem insert the pins at right angles to the edge to prevent stretching of the fabric.

On all materials except woollens the finished depth of the hem itself can now be measured. This is measured from the levelled edge and not from the raw edge of the material. For most hems a 3in. allowance should be the maximum but on children's garments more may be left for growth.

A quick guide for measuring a hem can be made with an envelope by cutting a notch in one edge the depth of the required hem. By placing the corner of the envelope on the edge of the hem and pinning around at the level of the notch, the job can be done more quickly than with a tape-measure.

The excess material can then be cut off, allowing sufficient to turn under (½in. to 1in.). On transparent materials the amount to be turned under should also be measured as it gives an ugly and untidy finish if the turn under is uneven.

Turn the extra allowance under at the measured width, leaving any pleats in position. Tack the edge. It is now ready for finishing.

HEM FINISHES

The quickest and neatest method of finishing a hem is by slip-hemming. This gives almost an invisible finish on the right side and has no loops of cotton to catch the heels on the wrong side. When slip-hemming, the needle should be slipped between the layers of the hem fold for a quarter to half an inch before picking up one or two threads of the single material. In this way the cotton is con-

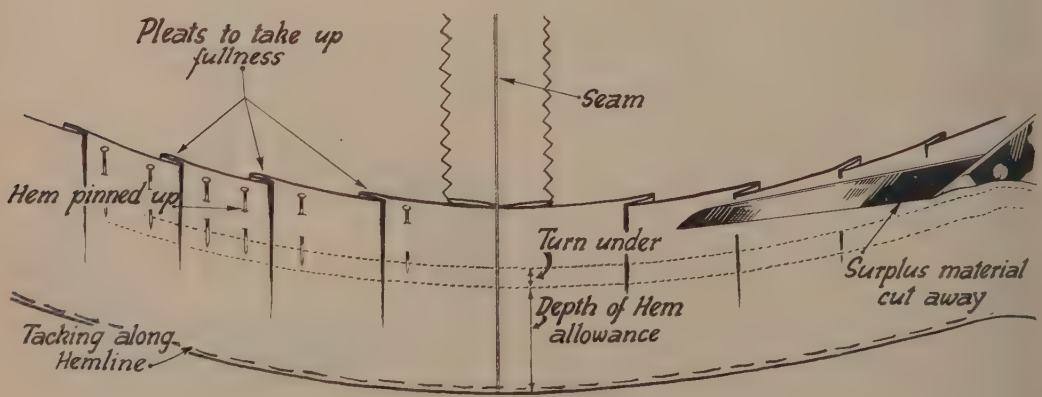


Fig. 2.—Taking up the hem

cealed completely except for a small V which appears where the stitch is made. On fine materials, pick up sufficient threads to give a firm stitch.

On coarse materials one thread should be enough. This is the stitch which will show on the right side therefore the smaller the amount picked up the more invisible the hem. It is easier to slip-stitch if the hem is left unpressed as the needle slides between the layers of the hem more readily.

For hems on dresses which are to be washed frequently, a row of machining may be worked along the turned edge of the hem before it is tacked down for slip-stitching. The hem allowance will have to be opened out to be machined and then folded back into its final position as of course this machining row should not show on the right side. Leave any pleats in position when machine stitching and this will help to hold them in place more firmly.

HEMS ON FLARED SKIRTS

Skirts which are cut with a flare should have a small hem allowance. If a large hem is turned it will give added weight to the skirt and on the crossway or bias sections the material will be continually stretching and making the hem uneven. This applies particularly on washing fabrics, where it will be found that, even with every care in ironing, the hemline will have altered. On very full flares it is also difficult to remove all the fullness in a hem without making a pointed line on the edge owing to the number of pleats which need to be put in. On a half-circle skirt a 2in. hem should be the maximum, while on a full circle the smaller the hem the better. Full gored skirts can have a larger hem allowance as the seams help these skirts to keep their shape.

The easiest and most satisfactory finish for a fully-flared skirt is to do a tiny machine-stitched hem. Allow a quarter to half-inch turning. One way to complete the edge is by turning up as small an amount as possible and machining on the folded edge (not the raw edge as this frays out very quickly). Then turn it up again and machine on the folded edge once more. This gives a machine-stitch on the right side and a small ridge on the wrong side, both of which are concealed by the fullness of the skirt. Many dressmakers machine about ¼in from the edge but you will find that this gives a rippled or ridged effect to the edge which cannot be removed and which becomes more pronounced after washing as the threads are stitched into a crooked position.

A second method of finishing is to turn the edge up a quarter to half an inch and machine on the edge of the fold. Then work another row of machining an even distance from the first. Use the edge of the foot on the machine as a guide for this row. This method is suitable for evening frocks or any which are not to be washed frequently. As the hem is only turned once this leaves a raw edge on the wrong side, but as it is machined twice it will not fray to any great extent.

If your machine has an attachment for small hems, this can be used to give a satisfactory finish on a flared skirt and entails only one row of machining.

For a pretty effect on a flared skirt, stretch the hem slightly as it is being machined and it will fall into small flutes when finished.

HEMS ON WOOLLEN MATERIALS

When finishing the hem on winter garments it is best to avoid turning under any allowance at all, so that there is no unnecessary bulk. Measure the hem an even distance all round as with other fabrics but cut off any excess fabric on this line. This leaves a raw edge which must be neatened before it can be fastened down to the body of the garment.

Paris binding, which can be bought in most haberdashery departments is a good finish for the hem and is made for this purpose. It is a type of ribbon with a dull finish about half and inch wide and comes in tonings of grey, brown, beige and black. Choose the colour nearest your fabric. To attach Paris binding, tack it onto the hem turning leaving about ¼in. underlap. Avoid fastening it through to the bulk of the garment by slipping a piece of paper under the hem turning. It is advisable to tack the binding on to ensure that it is not stretched causing puckering of the hem. The binding is machined on to the hem

turning which will have to be opened flat to allow this. The free edge should be fastened to the garment with slip-stitch or blind hemming. Any pleats which are inserted to remove fullness should be left in position and held down with the binding.

When Paris binding is not available or cannot be obtained in a toning close enough to the colour of your fabric, bias binding can be used in its place. Choose a soft binding and attach it in the same manner as the Paris binding. Extra care must be taken to avoid pulling it too tightly as the bias binding has more stretch than the Paris binding.

A third method of finishing the raw edge on winter materials is to bind the edge in the normal way with a bias binding. In the above method the binding is left flat. When the edge is bound it is doubled over again and either machine stitched or slip-stitched. This gives a very neat finish to the raw edge which can be attached to the body of the garment by slip-stitching as before. If this method is used be sure that the extra row of stitching involved in attaching the binding does not make the edge too stiff.

Hems on woollen fabrics, especially babies' clothes, may also be neatened by herringbone. This is worked over the raw edge and gives a very firm and flat finish. Only one line of stitches of the herringbone must show through on to the right side. A herringbone finish can also be used on heavy coats where the material is too thick or the coat too cumbersome to handle on a machine. The stitches can be worked very firmly into the material and are concealed by the thickness of the fabric.

With all hems, after stitching, a good pressing is necessary to complete the finish. Many people neglect this final step which can mar the appearance of an otherwise attractive garment.

FARMERS WINTER COURSES

The Principal of Muresk Agricultural College, Mr. W. Southern, has announced that a sheep husbandry course will be held at the college in mid-July.

Members of the course will assemble at the college on Tuesday evening, July 17, and the course will conclude on the afternoon of Friday, July 20.

The cost of the course, including residence, is £3 3s. Those wishing to enrol should apply to the Principal, Muresk Agricultural College, Muresk, or the Department of Agriculture, St. George's Terrace, Perth, for the necessary enrolment application form.

WEED CONTROL

The spraying programme for the control of blackberry has now been completed for this season. Work was undertaken in a number of districts, but the largest project was in the Manjimup-Pemberton area where more than 300 acres were treated. In this section tracks were bulldozed through about 50 acres of dense blackberry to gain access for spraying.

A contract for chaining and raking Mesquite on a North-West station has now been completed. One thousand acres, including the most heavily infested area, was chained two ways and then the uprooted plants were raked into windrows. Trees not handled effectively by chaining were bulldozed.

A further 230 acres were double chained and 720 acres single chained without subsequent raking.

QUEENSLAND TOADS

An unauthorised consignment of Queensland toads was discovered by officers of the Stock Branch of the Department of Agriculture.

These toads are considered a potential menace to the bee industry, and have been found to be a great nuisance in Queensland. They have been declared vermin, and any person who obtains any without a permit from the Chief Vermin Control Officer is liable to severe penalties. The toads are valuable for medical and scientific purposes and permits have been issued for their importation by the University and medical institutions.

Permits will not be issued to private individuals.

FERTILISERS

THE Fertiliser Act, 1928-1953, requires all fertilisers sold in this State to be registered annually, the registration year commencing on 1st November each year. A list of fertilisers registered for the current registration year appears in this issue. Departmental inspectors carry out regular inspection and sampling of fertilisers to see that those offered for sale comply with requirements of the Fertiliser Act, including the registered analysis. The knowledge that this work is being carried out, induces manufacturers to maintain their fertilisers close to and usually a little above the registered standard.

From the fertilisers registered unit values, i.e., the average commercial value of each one per cent. of a given ingredient per ton of fertiliser, have been calculated for the various forms of the main fertilising ingredients, nitrogen, phosphoric acid and potash. These values are arrived at from the average of prices quoted for each fertiliser at the time of registration and are at follows:—

	s.	d.
Nitrogen (N) as—		
Blood, Blood and Bone, Bone Dust and other animal fertilisers	93	9
Nitrate	48	2
Ammonia	37	5
Phosphoric Acid (P_2O_5) as—		
Water soluble in superphosphate	12	6
Citrate soluble in superphosphate	12	6
Acid soluble in superphosphate and rock phosphate	6	1
Blood and Bone, Bone Dust and other animal fertilisers	23	6
Potash (K_2O) as—		
Sulphate	17	6
Muriate (Chloride)	12	8

From unit values a comparison of the commercial value of fertilisers of similar types can be made. As will be appreciated however, it is not possible to compare, say for example, the value of nitrogen in blood and bone with that in sulphate of ammonia.

It should be remembered that unit values are average values arrived at from the prices of all fertilisers registered. The commercial values arrived at from the use of these figures will therefore in some cases be more and in others less than the actual selling price. Other points to be borne in mind are fluctuations which may occur during the year in market values and in the case of mixed fertilisers, e.g., potato manures, the cost of mixing and extra handling which must be added to figures arrived at from the use of unit values.

To calculate the value of a fertiliser from unit values the percentage of each ingredient in the fertiliser should be multiplied by its unit value and the results for each ingredient in the fertiliser totalled. An example of how this can be done and how a comparison of values can be made between fertilisers of similar types is as follows:—

	Nitrogen	Phosphoric Acid
	%	%
X Brand Blood and Bone	6.5	10.0
Y Brand Blood and Bone	5.5	13.0

The unit values of Nitrogen and Phosphoric Acid in Blood and Bone as set out above are 93s. 9d. and 23s. 6d. respectively. The comparative commercial value of X and Y Brand Blood and Bones would therefore be:—

X BRAND BLOOD AND BONE.

	s.	d.
6.5 units of nitrogen @ 93s. 9d. per unit	609	4½
10.0 units of phosphoric acid @ 23s. 6d. per unit	236	0
Total value	845	4½

Y BRAND BLOOD AND BONE.

5.5 units of nitrogen @ 93s. 9d. per unit	515	7½
13.0 units of phosphoric acid @ 23s. 6d. per unit	305	6
Total value	821	1½

The fertilising ingredients contained in X Brand are worth more than those in Y Brand and therefore if the two fertilisers were offered for sale at the same price the X Brand would obviously be the most economical to purchase.

Buyers of fertilisers are advised to consult the list of registered fertilisers and to ensure that packages containing fertilisers are correctly branded, i.e., carry a copy of the registered brand and name, before purchasing same.

If any doubts about a fertiliser arise inquiries should be made at the Department of Agriculture where information on the provisions and requirements of the Fertiliser Act and advice on matters concerning the use of fertilisers can be obtained.

The following fertilisers have been registered at the Department of Agriculture under the Fertiliser Act, 1928-1953 for the year commencing 1st November, 1955.

Name of Fertiliser.	Reg. No.	Brand.	By Whom Registered.	Nitrogen (N) as				Phosphoric Acid (P_2O_5) as				Potash (K_2O) as		Cash Price per ton at Works (W) or on Rails at Perth (P).
				Nitrate.	Ammonia.	Blood and Bone.	Bone Dust.	Water Soluble.	Citrate Soluble.	Acid Soluble.	Total.	Sulphate.	Muriate.	
				%	%	%	%	%	%	%	%	%	%	
A. MINERAL.														
1. Nitrogenous.														
(a) *Nitrogen as Nitrate.*														
Nitrate of Soda	90	C.S.M.L.	Cuming Smith & Mt. Lyall	16·00										£40/12/6 (B) (W) £39/17/6 (P) (W) £40/12/6 (G) (W)
Do. do.	12	Champion	R. Dundas Smith & Son	16·00	....	....	....	....	....	....	....	....	....	£37/5/0 (P)
Sodium Nitrate	167	Fauldings	F. H. Faulding & Co., Ltd.	16·00	....	....	....	....	....	..	....	..	..	£8/8/0 per cwt.
(b) *Nitrogen as Ammonia.*														
Sulphate of Ammonia ...	35	I.C.I.A.N.Z.	Cuming Smith & Mt. Lyall	....	20·50	....	....	....	....	..	..	..	....	£38/7/0 (P) £39/15/0 (G) £38/7/0 (B)
Do. do. do.	114	Blue Cross	Agricultural Products Co.	....	20·50	....	....	....	....	....	....	....	....	
Do. do. do.	126	David Gray's	David Gray & Co., Ltd.	..	20·50	..	..	..	..	..	..	..	..	2 lb. bags 1s. 8d. 7 lb. bags 5s. 3d.
Ammonium Nitrate	168	Fauldings	F. H. Faulding & Co., Ltd.	30·00	....	....	....	....	....	....	....	....	....	£7/19/0 per cwt.
Sulphate of Ammonia	169	do.	do. do. do.	....	20·00	....	....	....	....	....	....	....	.	£7/12/0 per cwt.
(c) *Nitrogen as Urea.*														
Urea—N.46	115	Blue Cross	Agricultural Products Co.	*46·00	....	....	..	..	..	....	....	....	....	
2. Phosphatic.														
(a) *Rock Phosphate.*														
Ground Phosphate Rock	16	A in diamond	Albany Superphosphate Co. Pty. Ltd.	....	....	....	....	....	....	36·60	36·60	....	....	£11/3/0 (W) (A)
Do. do. do.	38	M.L. in diamond	Cuming Smith & Mt. Lyall	....	....	....	....	....	....	36·60	36·60	....	....	£11/3/0 (W)
Do. do. do.	50	Sickle	do. do. do.	....	....	....	....	....	....	36·60	36·60	....	....	£11/3/0 (W)
Do. do. do.	68	C.S.M.L.	do. do. do.	....	....	....	....	....	....	36·60	36·60	....	....	£11/3/0 (W)
Do. do. do.	133	Cresco	Cresco Fertilizers (W.A.), Ltd.	....	....	....	....	....	....	36·60	36·60	....	....	£11/3/0 (W)
(b) *Superphosphate.*														
Superphosphate 23%	15	A in diamond	Albany Superphosphate Co. Pty. Ltd.	..	....	..	..	17·00	3·00	3·00	23·00	....	..	£13/8/0 (W) (A)
Do. 23%	36	M.L. in diamond	Cuming Smith & Mt. Lyall	..	..	....	..	17·00	3·00	3·00	23·00	..	....	£13/8/0 (W)

Florida Superphosphate 23%	49	Sickle	do.	do.	do.	....	....	....	....	17·00	3·00	3·00	23·00	....	....	£13/8/0 (W)
Superphosphate 23%	67	C.S.M.L.	do.	do.	do.	....	....	....	....	17·00	3·00	3·00	23·00	....	....	£13/8/0 (W)
Do.	116	Blue Cross	Agricultural Products Co.			....	....	....	....	17·00	3·00	3·00	23·00	....	....	
Do.	125	David Gray's	David Gray & Co., Ltd.			....	....	....	....	17·00	3·00	3·00	23·00	....	....	7 lb. bags 2s. 3d. 112 lb. bags 25s. 6d.
Do. 23%	131	Cresco	Cresco Fertilizers (W.A.), Ltd.			....	....	....	....	17·00	3·00	3·00	23·00	....	....	£13/8/0 (W)
(c) *Rock Phosphate and Superphosphate.*																
50/50 Mixture	17	A in diamond	Albany Superphosphate Co.			....	....	....	....	8·50	1·50	20·00	30·00	....	....	£13/0/6 (W) (A)
Do.	37	Mt. Lyall as M.L. in diamond	Cuming Smith & Mt. Lyall			....	....	....	....	8·50	1·50	20·00	30·00	....	....	£13/0/6 (W)
Do.	51	Sickle	do.	do.	do.	....	....	....	....	8·50	1·50	20·00	30·00	....	....	£13/0/6 (W)
Do.	69	C.S.M.L.	do.	do.	do.	....	....	....	....	8·50	1·50	20·00	30·00	....	....	£13/0/6 (W)
Do.	132	Cresco	Cresco Fertilizers (W.A.), Ltd.			....	....	....	....	8·50	1·50	20·00	30·00	....	....	£13/0/6 (W)
(d) *Superphosphate and Minor Elements.*																
Super and Copper Ore	18	A in diamond	Albany Superphosphate Co. Pty., Ltd.			....	....	Copper. 1·00	....	13·00	2·25	3·75	19·00	....	....	£17/2/1 (W) (A)
Super and Zinc No. 2	19	do.	do.	do.	do.	....	....	....	Zinc. 1·15	16·50	2·75	3·25	22·50	....	....	£15/6/6 (W) (A)
Super, Copper Ore and Zinc	20	do.	do.	do.	do.	....	....	Copper. 1·00	Zinc. 1·15	12·75	2·25	3·50	18·50	....	....	£18/5/6 (W) (A)
Super and Manganese	21	do.	do.	do.	do.	....	Manganese 3·80	....	....	14·50	2·50	2·50	19·50	....	....	£25/11/8 (W) (A)
Super and Molybdenum	22	do.	do.	do.	do.	Molybdenum trace	....	....	....	17·00	3·00	3·00	23·00	....	....	£15/9/1 (W) (A)
Super and Potash	23	do.	do.	do.	do.	....	....	....	....	14·00	2·50	2·50	19·00	....	9·00	£18/7/11 (W) (A)
Super and Cobalt	24	do.	do.	do.	do.	Cobalt trace	....	....	....	17·00	3·00	3·00	23·00	....	....	£16/10/0 (W) (A)
Super, Copper, Zinc and Cobalt	25	do.	do.	do.	do.	Cobalt trace	....	Copper 1·00	Zinc. 1·15	12·75	2·25	3·50	18·50	....	....	£20/12/8 (W) (A)
Super and Copper Ore	39	Mount Lyall as ML in diamond	Cuming Smith & Mt. Lyall			....	....	Copper 1·00	Zinc 1·15	13·00	2·25	3·75	19·00	....	....	£17/2/1 (W)
Super and Zinc, No. 2	40	do.	do.	do.	do.	....	....	....	Zinc 1·15	16·50	2·75	3·25	22·50	....	....	£15/6/6 (W)
Super, Copper Ore and Zinc	41	do.	do.	do.	do.	....	....	Copper 1·00	Zinc 1·15	12·75	2·25	3·50	18·50	....	....	£18/5/6 (W)
Super and Potash	42	do.	do.	do.	do.	....	....	....	....	14·00	2·50	2·50	19·00	....	9·00	£18/1/1 (W)
Super and Molybdenum	52	Sickle	do.	do.	do.	Molybdenum trace	....	....	....	17·00	3·00	3·00	23·00	....	....	£15/9/1 (W)
Super and Cobalt	53	do.	do.	do.	do.	Cobalt trace	....	....	....	17·00	3·00	3·00	23·00	....	....	£16/10/0 (W)
Super, Copper, Zinc and Cobalt	54	do.	do.	do.	do.	Cobalt trace	....	Copper 1·00	Zinc 1·15	12·75	2·25	3·50	18·50	....	....	£20/12/8 (W)
Super and Potash	55	do.	do.	do.	do.	....	....	....	....	14·00	2·50	2·50	19·00	....	9·00	£18/1/1 (W)
Super and Copper Ore	56	do.	do.	do.	do.	....	....	Copper 1·00	....	13·00	2·25	3·75	19·00	....	....	£17/2/1 (W)
Super and Zinc, No. 2	57	do.	do.	do.	do.	....	....	....	Zinc 1·15	16·50	2·75	3·25	22·50	....	....	£15/6/6 (W)
Super, Copper Ore and Zinc	58	do.	do.	do.	do.	....	....	Copper 1·00	Zinc 1·15	12·75	2·25	3·50	18·50	....	....	£18/5/6 (W)
Super and Manganese	59	do.	do.	do.	do.	....	Manganese 3·80	....	....	14·50	2·50	2·50	19·50	....	....	£25/11/8 (W)

(P) Denotes Perth. (G) Denotes Geraldton. (B) Denotes Bunbury. * Nitrogen as Urea.

FERTILISERS—continued.

Name of Fertiliser.	Reg. No.	Brand.	By Whom Registered.	Nitrogen (N) as				Phosphoric Acid (P_2O_5) as				Potash (K_2O) as		Cash Price per ton at Works (W) or on Rails at Perth (P).
				Nitrate.	Ammonia.	Blood and Bone.	Bone Dust.	Water Soluble.	Citrate Soluble.	Acid Soluble.	Total.	Sulphate.	Muriate.	
				%	%	%	%	%	%	%	%	%	%	
Super and Copper Ore	70	C.S.M.L.	Cuming Smith & Mt. Lyall			Copper 1·00	....	13·00	2·25	3·75	19·00	....	....	£17/2/1 (W)
Super and Zinc, No. 2	71	do.	do. do. do.	....	....	....	Zinc 1·15	16·50	2·75	3·25	22·50	....	....	£15/6/6 (W)
Super, Copper Ore and Zinc	72	do.	do. do. do.	....	....	Copper 1·00	Zinc 1·15	12·75	2·25	3·50	18·50	....	....	£18/5/6 (W)
Super and Cobalt	73	do.	do. do. do.	Cobalt trace	....	....	....	17·00	3·00	3·00	23·00	....	....	£16/10/0 (W)
Super, Copper, Zinc and Cobalt	74	do.	do. do. do.	Cobalt trace	....	Copper 1·00	Zinc 1·15	12·75	2·25	3·50	18·50	....	....	£20/12/8 (W)
Super and Potash	75	do.	do. do. do.	....	....	....	....	14·00	2·50	2·50	19·00	....	9·00	£18/4/2 (W)
Super and Molybdenum	76	do.	do. do. do.	Molybdenum trace	....	....	....	17·00	3·00	3·00	23·00	....	....	£15/9/1 (W)
Super and Manganese	77	do.	do. do. do.	....	Manganese 3·80	....	....	14·50	2·50	2·50	19·50	....	....	£25/11/8 (W)
Super and Copper Ore ...	134	Cresco ...	Cresco Fertilizers (W.A.), Ltd.	..	...	Copper 1·00	....	13·00	2·25	3·75	19·00	..	.	£17/2/1 (W)
Super and Manganese	135	do.	do. do. do.	....	Manganese 3·80	....	....	14·50	2·50	2·50	19·50	....	....	£25/11/8 (W)
Super and Zinc Oxide	136	do.	do. do. do.	....	....	....	Zinc 1·15	16·50	2·75	3·25	22·50	....	....	£15/6/6 (W)
Super and Molybdenum	137	do.	do. do. do.	Molybdenum trace	....	....	....	17·00	3·00	3·00	20·00	....	....	£15/9/1 (W)
Super and Cobalt	138	do.	do. do. do.	Cobalt trace	....	....	....	17·00	3·00	3·00	20·00	....	....	£16/10/0 (W)
Super, Copper Ore and Zinc Oxide	139	do.	do. do. do.	....	....	Copper 1·00	Zinc 1·15	12·75	2·25	3·50	18·50	....	....	£18/5/6 (W)
Super and Potash	140	do.	do. do. do.	....	....	....	....	14·00	2·50	2·50	19·00	....	9·00	£18/1/1 (W)
Super and Minor Elements	141	do.	do. do. do.	....	Manganese 2·25	Copper 0·80	Zinc 2·25	11·75	2·50	2·50	16·50	....	....	£25/17/10 (W)
Super and Copper Sulphate	142	do. –	do. do. do.	....	....	Copper 1·25	....	16·00	2·75	2·75	21·50	....	....	£22/11/9 (W)
Do. do. do.	154	C.S.M.L.	Cuming Smith & Mt. Lyell	....	....	Copper 1·25	....	16·00	2·75	2·75	21·50	....	....	£22/11/9 (W)
3. Potassic.														
(a) *Potash as Sulphate.*														
Sulphate of Potash	33	Sun	Cuming Smith & Mt. Lyell	....	....	....	....	....	....	....	....	48·00	....	£41/19/6 (P) (W) £44/16/0 (G) (W) £42/16/0 (B) (W)
(b) *Potash as Muriate.*														
Muriate of Potash	34	Sun	Cuming Smith & Mt. Lyell	....	....	....	....	....	....	....	....	....	58·00	£35/6/0 (P) (W) £36/4/0 (B) (W)
Do. do.	101	Blue Cross	Agricultual Products Co.	....	....	....	....	....	....	....	....	....	58·00	
Do. do.	124	David Gray's	David Gray & Co., Ltd.	....	....	....	....	....	....	....	....	....	58·00	2 lb. 1s. 8d. 7 lb. 5s. 6d.

4. Superphosphate and Insecticides.				D.D.T.									
D.D.T. Superphosphate....	78	C.S.M.L.	Cuming Smith & Mt. Lyell	0·25	....	....	....	16·00	2·75	3·00	21·75	....	....	£17/18/7 (W)
				D.D.T.									
Do. do. do.	60	Sickle	do. do. do.	0·25	....	....	....	16·00	2·75	3·00	21·75	....	....	£17/18/7 (W)
				D.D.T.									
Do. do. do.	32	A in diamond	Albany Superphosphate Co.	0·25	....	....	....	16·00	2·75	3·00	21·75	....	....	£17/18/7 (W) (A)
5. Nitrogen and Phosphoric Acid.														
Lawn Manure	2	Dawn	Dawn Fertilizers	....	8·54	....	....	9·23	1·36	0·82	11·40	....	....	
Plant Food	3	do.	do. do.	....	5·23	....	....	11·21	1·41	1·46	14·08	....	....	
Lawn Manure	106	Blue Cross	Agricultural Products Co.	....	4·00	....	....	3·00	3·00	6·00	12·00	2·00	....	
Lawn Fertilizer	123	David Gray's	David Gray & Co., Ltd.	....	5·00	....	....	2·80	1·03	2·10	5·93	....	3·20	4s. 7 lb. packet. 7s. 9d. 14 lb. packet.
Potato Manure "C	27	A in diamond	Albany Superphosphate Co.	....	3·50	....	....	14·00	2·50	2·25	18·75	....	....	£20/0/1 (W) (A)
Do. do.	43	Mount Lyell as M.L. in diamond	Cuming Smith & Mt. Lyell	....	3·50	....	....	14·00	2·50	2·25	18·75	....	....	£20/0/1 (W)
Do. do.	61	Sickle	do. do. do.	....	3·50	....	....	14·00	2·50	2·25	18·75	....	....	£20/0/1 (W)
Do. do.	79	C.S.M.L.	do. do. do.	....	3·50	....	....	14·00	2·50	2·25	18·75	....	....	£20/5/0 (G) £20/0/1 (P.J.)
.... Do. do.	145	Cresco	Cresco Fertilizers (W.A.), Ltd.		3·50	....	....	14·00	2·50	2·25	18·75	....	....	£20/0/1 (W)
6. Nitrogen Phosphoric Acid and Potash.														
Nitrophoska B.A.S.F.	14	Nitrophoska B.A.S.F.	Tropical Traders & Pattersons	....	13·00	....	....	4·30	8·70	....	13·00	....	20·00	£65/15/0 (P)
Potato Manure "A"	26	A in diamond	Albany Superphosphate Co.	....	2·50	....	....	13·25	2·25	2·50	18·00	....	5·00	£20/18/5 (W) (A)
Do. "B"	28	do.	do. do. do.	....	3·50	....	....	12·50	2·00	2·25	16·75	....	5·00	£22/4/1 (W)
Do. "E"	29	do.	do. do. do.	....	3·50	....	....	11·50	2·00	2·00	15·50	....	8·00	£23/10/7 (W)
Orchard Manure	30	do.	do. do. do.	....	3·50	....	....	12·50	2·00	2·25	16·75	....	5·00	£22/4/1 (W)
Garden Fertilizer	31	do.	do. do. do.	....	3·50	....	....	11·50	2·00	2·00	15·50	....	8·00	£23/10/7 (W)
Potato Manure "A"	44	Mount Lyell as M.L. in diamond	Cuming Smith & Mt. Lyell	....	2·50	....	....	13·25	2·25	2·50	18·00	....	5·00	£20/14/11 (W)
Do. "B"	45	do.	do. do. do.	....	3·50	....	....	12·50	2·00	2·25	16·75	....	5·00	£22/0/7 (W)
Do. "E"	46	do.	do. do. do.	....	3·50	....	....	11·50	2·00	2·00	15·50	....	8·00	£23/5/0 (W)
Orchard Manure	47	do.	do. do. do.	....	3·50	....	....	12·50	2·00	2·25	16·75	....	5·00	£22/0/7 (W)
Garden Fertilizer	48	do.	do. do. do.	....	3·50	....	....	11·50	2·00	2·00	15·50	....	8·00	£23/5/0 (W)
Potato Manure "A"	62	Sickle	do. do. do.	....	2·50	....	....	13·25	2·25	2·50	18·00	....	5·00	£20/14/11 (W)
Do. "B"	63	do.	do. do. do.	....	3·50	....	....	12·50	2·00	2·25	16·75	....	5·00	£22/0/7 (W)
Do. "E"	64	do.	do. do. do.	....	3·50	....	....	11·50	2·00	2·00	15·50	....	8·00	£23/5/0 (W)
Orchard Manure	65	do.	do. do. do.	....	3·50	....	....	12·50	2·00	2·25	16·75	....	5·00	£22/0/7 (W)
Garden Fertilizer	66	do.	do. do. do.	....	3·50	....	....	11·50	2·00	2·00	15·50	....	8·00	£23/5/0 (W)
Potato Manure "A"	80	C.S.M.L.	do. do. do.	....	2·50	....	....	13·25	2·25	2·50	18·00	....	5·00	£20/16/6 (W)
Do. "A2"	81	do.	do. do. do.	....	2·50	....	....	13·25	2·25	2·50	18·00	5·00	....	£22/9/5 (W)
Do. "B"	82	do.	do. do. do.	....	3·50	....	....	12·50	2·00	2·25	16·75	....	5·00	£22/2/2 (W)
Do. "E"	83	do.	do. do. do.	....	3·50	....	....	11·50	2·00	2·00	15·50	....	8·00	£23/7/6 (W)
Do. "E2"	84	do.	do. do. do.	....	3·50	....	....	11·50	2·00	2·00	15·50	5·00	....	£22/9/5 (W)
Orchard Manure	85	do.	do. do. do.	....	3·50	....	....	12·50	2·00	2·25	16·75	....	5·00	£22/2/2 (W)
Tomato Manure	86	do.	do. do. do.	....	3·50	....	....	10·25	1·50	2·00	13·75	10·00	....	£27/7/11 (W)
Tobacco Fertilizer	87	do.	do. do. do.	....	3·30	....	....	11·50	2·00	2·25	15·75	5·70	....	£24/4/0 (W)
Tobacco Fertilizer, No. 2	88	do.	do. do. do.	....	3·30	Copper trace	Zinc trace	11·00	2·00	2·00	15·00	5·70	....	£24/14/7 (W)
Garden Fertilizer	89	do.	do. do. do.	....	3·50	....	....	11·50	2·00	2·00	15·50	....	8·00	£23/7/6 (W)
Potato Manure "A"	117	Blue Cross	Agricultural Products Co.	....	2·50	....	....	13·25	2·25	2·50	18·00	....	5·00	
Do. "E"	118	do.	do. do. do.	....	3·50	....	....	11·50	1·25	2·75	15·50	....	8·00	
Fertosol	119	do.	do. do. do.	Urea ‡23·00	12·00	....	....	16·00	....	....	16·00	....	8·00	
Potato Manure "A"	127	David Gray's	David Gray & Co., Ltd.	....	2·50	....	....	13·25	2·25	2·50	18·00	....	5·00	3s. per 7 lb. packet. 3s. 3d. per 7 lb. pkt.
Do. "E"	128	do.	do. do. do.	....	3·50	....	....	11·50	1·25	2·75	15·50	....	8·00	6s. per 14 lb. packet.

(P) Denotes Perth. (G) Denotes Geraldton. (B) Denotes Bunbury. (P.J.) Denotes Picton Junction. ‡ Includes Nitrogen as Urea.

FERTILISERS—continued.

Name of Fertiliser.	Reg. No.	Brand.	By Whom Registered.	Nitrogen (N) as				Phosphoric Acid (P_2O_5) as				Potash (K_2O) as		Cash Price per ton at Works (W) or on Rails at Perth (P).
				Nitrate.	Ammonia.	Blood and Bone.	Bone Dust.	Water Soluble.	Citrate Soluble.	Acid Soluble.	Total.	Sulphate.	Muriate.	
				%	%	%	%	%	%	%	%	%	%	
Potato Manure "A"	143	Cresco	Cresco Fertilizers (W.A.), Ltd.	....	2·50	....	....	13·25	2·25	2·50	18·00	....	5·00	£20/14/11 (W)
Do. "B"	144	do.	do. do. do.	....	3·50	....	....	12·50	2·00	2·25	16·75	....	5·00	£22/0/7 (W)
Do. "E"	146	do.	do. do. do.	....	3·50	....	....	11·50	2·00	2·00	15·50	....	8·00	£23/5/0 (W)
Orchard Manure	147	do.	do. do. do.	....	3·50	....	....	12·50	2·00	2·25	16·75	....	5·00	£22/0/7 (W)
Foli 8	157	George C. Warner	George C. Warner Laboratories Pty., Ltd.	....	‡20·00	....	....	20·00	....	....	20·00	†20·00	....	
Gard-N-Tabs	158	do.	do. do. do.	....	14·00	....	....	38·00	....	....	38·00	†24·00	....	
Rose Manure	122	David Gray's	David Gray & Co., Ltd.	....	5·00	....	....	2·80	1·03	2·10	5·93	3·20	....	4s. 3d. per 7 lb. pkt. 8s. per 14 lb. pkt.
Orchard Manure	165	P.P.	Picton Produce Pty., Ltd.	....	....	2·75	....	7·50	....	14·00	21·50	2·00	....	£24/10/0 (W)
Garden Fertilizer	164	do.	do. do. do.	....	....	2·75	....	7·50	....	14·00	21·50	2·00	....	
Cave Guano	163	Batsos	Batsos Fertilizer Co.	....	....	4·00	....	....	....	....	8·00	3·00	....	7 lb. pkts. 5s.
Bulb and Corm Manure	4	Dawn	Dawn Fertilizers	....	1·90	....	....	9·20	1·40	0·80	11·40	....	9·00	
7. Liquid Fertiliser.														
Liquid Fertiliser	129	David Gray's	David Gray & Co., Ltd.	....	9·00	....	....	6·00	....	....	6·00	4·00	....	4s. 3d. per 20 gall. bot.
Do. do.	102	Blue Cross	Agricultural Products Co.	....	‡6·50	....	....	5·00	....	....	5·00	....	†3·00	
Liquid Manure	156	Keoughs	Wilcox Mofflin, Ltd.		1·70	....	....	1·50	....	....	1·50	....	2·00	2s. per 20 oz. bottle.
Concentrated Fertiliser	170	Spring	F. H. Faulding & Co., Ltd.	7·50		....	....	5·00	....	....	5·00	4·00*	....	£1/18/0 per dozen 16 oz. bottles.
8. Agricultural Lime.														
Garden Lime	108	Blue Cross	Agricultural Products Co.	Calcium Oxide (CaO) 40% in the form of Calcium Carbonate ; 75% Equivalent to Calcium Carbonate.										
9. Organic.														
(a) *Blood and Bone.*														
Blood and Bone	166	P.P.	Picton Produce Pty., Ltd.	....	....	5·00	....	....	5·00	10·00	15·00	....	....	£34/0/0 (W)
Do. do.	161	Sound	Cockburn Sound Fertilisers	....	....	5·25	....	....	2·50	6·50	9·00	....	....	£32/0/0 (W)
Blood and Bone 5% Nitrogen	152	Wesfarmers	Westralian Farmers Co-op, Ltd.	....	....	5·00	....	....	8·85	9·90	18·75	....	....	£27/10/0 (W) £43/0/0 (P)
Blood and Bone	151	do.	do. do. do.	....	....	5·00	....	....	2·00	8·00	10·00	....	....	£34/5/0 (P)
Do. do.	148	Wooltana	Wooltana Industries, Ltd.	....	....	6·00	....	....	2·00	8·00	10·00	....	....	£45/0/0 (P)
Do. do.	130	David Gray's	David Gray & Co , Ltd.	....	....	5·00	....	....	....	....	9·00	....	....	58s. per cwt.
Do. do.	95	Apex	E. J. Fry Pty., Ltd.	....	....	6·00	....	....	4·00	11·00	15·00	....	....	£41/0/0 (W) £41/0/0 (P)
Do. do. Manure	93	Kitchen's	J. Kitchen & Sons Pty., Ltd.	....	....	6·80	....	....	9·00	5·00	14·00	....	....	£39/5/0 (P)
Do. do.	92	Pannifex....	Burridge & Warren Pty., Ltd.	....	....	5·00	....	....	6·00	8·00	14·00	....	....	£28/7/6 (W) £50/0/0 (P)
Do. do.	13	Wyndham	Wyndham Freezing, Canning and Meat Works	....	....	6·00	....	....	5·50	9·50	15·00	....	....	£24/15/0 (W) £32/10/0 (P)
Do. do.	11	T.B. & S. in diamond	Thomas Borthwick & Sons	....	....	5·75	....	....	6·75	5·25	12·00	....	....	£40/0/0 (W)
(b) *Animal Fertiliser.*														
Animal Fertiliser	1	A.N.A. Surprise	C. A. Kirkby & Sons	....	....	5·00	....	....	4·00	10·00	14·00	....	....	£23/10/0 (W) £40/5/0 (P)
Do. do.	10	Midland	Midland Junction Abattoir Board	....	....	8·00	....	0·50	3·00	1·50	5·00	....	....	£20/0/0 (W)
Garden Fertilizer	91	Cormo	Nor-West Fertilizers	....	....	4·00	....	3·00	1·0	2·00	6·00	....	....	£25/0/0 (W)
Blood and Bone Fertiliser	103	Blue Cross	Agricultural Products Co.	....	....	5·00	....	....	3·0	9·00	12·00	....	....	
Animal Fertilizer	104	do.	do. do. do.	....	....	3·50	....	....	3·0	9·00	12·00	....	....	
Do. do.	149	Wooltana	Wooltana Industries, Ltd.	....	....	4·00	....	....	1·0	8·15	9·15	....	....	£28/10/0 (P)
Do do.	150	do.	do. do. do.	....	....	4·00	....	....	1·0	8·15	9·15	....	....	£28/10/0 (P)
Fertiliser	159	Sprout-Em	Kag Manufacturing Co.	....	....	2·50	....	....	5·0	4·00	9·00	....	....	
Garden Fertilizer	160	Sound	Cockburn Sound Fertilisers	....	....	4·00	....	....	2·0	4·00	6·00	....	....	£25/0/0 (W)

(c) *Blood Meal. Fertilisers.*															
Dried Blood	153	Wesfarmers	Westralian Farmers Co-op., Ltd.	....	....	12·00	....	....	....	....	....	....	....	£80/0/0 (P)
(d) *Fish Fertiliser.*															
Fish and Bone	94	Apex	E. J. Fry Pty., Ltd.	....	....	6·00	....	....	3·00	4·00	7·00	....	....	£40/15/0 (W) £41/10/0 (P)
Fish and Bone Manure	120	David Gray's	David Gray & Co., Ltd.	....	....	4·00	....	....	....	....	9·00	....	....	7 lb. bags 4s. 3d. 112 lb. bags 58s.
Fish Fertilizer	162	Sound	Cockburn Sound Fertilizers	....	....	5·00	....	....	2·00	6·00	8·00	....	....	£28/0/0 (W)
10. Nitrogen Phosphoric Acid and Potash.															
Seedling Manure	5	Dawn	Dawn Fertilisers	....	5·30	....	....	8·75	1·25	1·00	11·00	....	4·40		
Rose Manure	6	do.	do. do.	....	5·90	....	....	10·30	1·52	0·91	12·70	....	1·64		
Superhumus, No. 1	7	do.	do. do.	....	2·00	....	....	1·80	0·50	0·20	2·50	....	2·00		
Do. No. 2	8	do.	do. do.	....	4·00	....	....	3·00	0·50	6·50	10·00	....	0·50		
(c) *Mineral and Organic Mixed.*															
No. 1 Fertilizer	96	Apex	E. J. Fry Pty., Ltd.	....	....	5·00	....	3·00	1·50	4·50	9·00	....	2·00	£37/0/0 (W)	
Rose Manure	97	do.	E. J. Fry, Pty., Ltd.	....	....	3·00	....	5·00	2·00	6·00	13·00	....	9·00	£39/10/0 (W)	
Growth Fertiliser Tablets	98	Summit	L. M. McLeod	4·10	....	....	....	7·00	1·20	0·10	8·30	....	†12·20		
Fertiliser	99	Clarksons	Clarksons (W.A.), Pty., Ltd.	....	5·60	....	....	2·80	1·03	2·10	5·93	....	3·20	7 lb. pack 4s. 3d.	
Bulbo	100	Blue Cross	Agricultural Products Co.	....	....	2·25	....	3·00	3·50	3·50	10·00	....	4·50		
Special Garden Fertiliser	105	do.	do. do. do.	....	4·00	....	....	3·00	3·00	6·00	12·00	2·50	....		
Rose Bush Fertiliser	107	do.	do. do. do.	....	4·00	....	....	2·50	2·50	5·00	10·00	3·00	....		
Boost Crop	110	do.	do. do. do.	....	....	4·50	....	1·00	4·00	5·00	10·00	3·00	....	£50/0/0 (P)	
Hydrangea Blueing Tonic	111	do.	do. do. do.	....	2·00	....	....	....	....	....	2·00	3·0		3s. 6d. per 1 lb. pket.	
Citrus Manure	112	do.	do. do. do.	....	5·00	....	....	....	5·00	4·00	9·00			3s. 6d. per 4 lb. pkt.	
Cardex	113	do.	do. do. do.	....	....	5·00	....	....	2·00	....	2·00	....	2·50	4s. per 1 lb. pkt.	
Powdered Fertiliser	121	David Gray's	David Gray & Co., Ltd.	....	5·00		....	2·80	1·03	2·10	5·93	....	3·20	4s. per 7 lb. pkt. 7s. 9d. per 14 lb. pkt.	
(d) *Trace Elements.*															
Tracels	9	Dawn	Dawn Fertilisers	Trace Elements.	....	....	....	....	....	....	....	....	....		
Minorels	109	Blue Cross	Agricultural Products Co.	Trace Elements.	....	....	....	....	....	....	....	....	....		

† Potash as Nitrate. (A) Denotes Albany. (G) Denotes Geraldton. ‡ Includes Nitrogen as Urea. † Potash as Nitrate.

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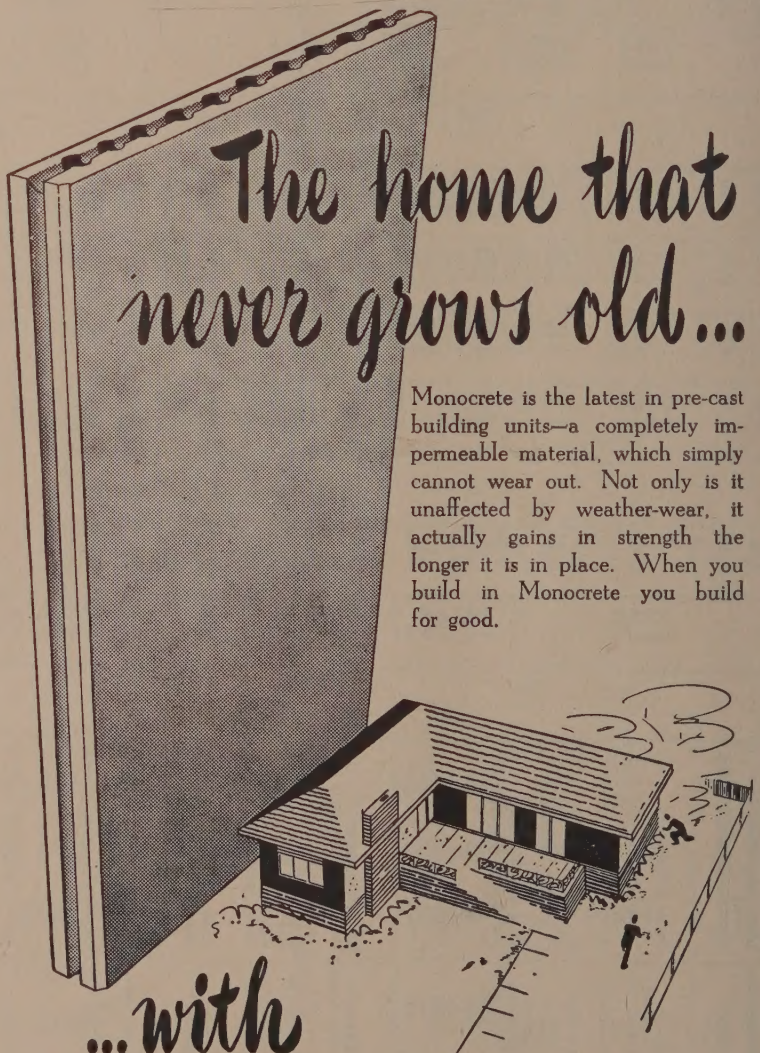

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